# BUREAU VERITAS

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# STRUCTURAL STABILITY ASSESSMENT OF EXISTING CHANDERKUNJ ARMY RESIDENTIAL TOWER-C OF ARMY WELFARE HOUSING ORGANIZATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA.

**APRIL 2023**


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# STRUCTURAL STABILITY ASSESSMENT OF EXISTING CHANDERKUNJ ARMY RESIDENTIAL TOWER-C OF ARMY WELFARE HOUSING ORGANIZATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

## APRIL - 2023

## ACKNOWLEDGEMENT

We are thankful to the concerned authorities of M/s Army Welfare Housing Organization, Kochi, for their kind co-operation during the assessment. We appreciate the courtesy & support extended to the Bureau Veritas auditors.

- Bureau Veritas (India) Pvt. Ltd.

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| | | |
|---|---|---|
| **Report on** | : | Structural Stability Assessment Of Existing Chanderkunj Army Residential Tower-C Of Army Welfare Housing Organization (AWHO) At Silver Sand Island, Vytilla, Kochi, Kerala |
| **Report for** | : | M/s Army Welfare Housing Organization (AWHO) Vytilla, Kochi, Kerala. |
| **Reference** | : | …….. |
| **Period of Assessment** | : | 18th January 2023 to 24th March 2023 |
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| **Assessment carried out in the presence of** | **:** | Lt. Col. Sidhartha Singhal<br>Project Director<br>Army Welfare Housing Organization<br><br>Rear Admiral P Ashokan (Retd.)<br>President<br><br>Mr. Jaya Kumar Velloor<br>Manager<br><br>Residential Welfare Association (RWA)<br>Managing committee, Chanderkunj Army towers<br>Kochi |
| **Date of submission of Pre-final report** | **:** | 30th April 2023 |

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# 1. INTRODUCTION

The existing **"Chanderkunj Army Residential Towers"** located at Silver Sand Island, Vytilla, Kochi, Kerala is a conventional RC framed structure with infilled masonry walls. The residential complex consists of three towers namely A, B, C and Club House.

**Tower A :** comprises of ground plus fourteen upper floors.
**Tower B :** comprises of common basement, ground floor plus twenty-seven upper floors with Helipad in Terrace.
**Tower C :** comprises of common basement, ground floor plus twenty-seven upper floors with Helipad in Terrace.
**Club House :** consists of ground plus one upper floor.
These residential blocks were reported to be constructed about 6 years back and since then most of the flats were occupied.

Off late, in continuation to previous evaluation of partial structure carried out by M/s. BVIPL and structural peer review by Govt Engineering College, Thiruvananthapuram the concerned authorities of **M/s Army Welfare Housing Organisation (AWHO)** and **Residential Welfare Association (RWA) of Chanderkunj Army Residential Towers** wanted to assess the structural stability and residual life of Tower -C and Tower -B structures in totality in view of distress features observed such as Cracks, spalling of cover concrete, exposure of rebars in RC members & continuous leakage/seepage of water from RC retaining wall & slab, dampness/damp patches, peeling of paint were observed in RC members in the Tower B & C.
Hence, a reference was made to M/s Bureau Veritas India Pvt. Ltd, to assess structural stability of Tower B & C structures in totality from basement to terrace including Helipad and to suggest appropriate restoration /corrective measures to enhance the longevity of the structure.

In response to this, a detailed investigative study was carried out by M/s Bureau Veritas India Pvt. Ltd. from **18th January 2023** and **24th February 2023** by conducting the visual inspection, Drone survey, Non-destructive tests, lab tests to assess the quality/strength of concrete in RC members & laboratory tests to assess the Core Compressive Strength, Chloride content, Sulphate content & pH level in concrete samples. Based on the results of

various tests mentioned above a detailed theoretical verification and design check was carried out to analyze the structural adequacy with respect to distress/deficiency noticed in the structure. This report, in brief, summarizes the outcome of the visual inspection, drone survey, Non-destructive test results, lab test results, theoretical analysis and recommendations made for common basement and Tower-C in order to enhance the longevity of the structure.

## 2. BACKGROUND OF PROJECT

In view of distress features observed such as Cracks, spalling of cover concrete, exposure of rebars in RC members & continuous leakage/seepage of water from RC retaining wall & slab, dampness/damp patches, peeling of paint were observed in RC members in the Tower B & C based on the requirement of SIPL/AWHO/RWA soundness assessment of common basement of tower-B& C and terrace floors were investigated by M/s. Bureau Veritas India Pvt Ltd, Cochin and report was submitted during 2021.

Using the observations, non destructive test results and lab results of the study report submitted by BVIPL during 2021, AWHO appointed Government Engineering College, Barton Hill, Thiruvananthapuram (GEC) to study the status of the tower B& C and to carry out the analysis of the these towers to understand the deficiency in the structure and to propose the retrofitting methods, if required. As per the information gathered and details furnished, GEC has done the physical observations of these towers, prepared design basis report, ETABS Model based on the drawings supplied to them. Using the Condition Assessment of tower B & C furnished by B, GEC furnished the details of adequacy evaluation of columns, shear walls of the tower C in terms of Demand /Capacity to carry the gravitational load (DL & LL) and lateral loads, and proposed the retrofitting scheme for the distressed elements of these towers. Adequacy of Foundation, Retaining Walls and Slab and Beams details are not furnished.

AWHO appointed Bureau Veritas for reviewing the Structural Assessment of the tower B & C and strengthening schemes proposed by the GEC. The scope of work of BV is limited to review of the Structural Assessment of Tower B & C and the Structural Assessment methodology adopted by GEC. To provide BOQ for the retrofitting works and propose three (3Nos) contractors for retrofitting works.

There was no binding for BV in deciding the retrofitting contractors and it is sole responsibility of AWHO. Structural Peer Review and findings on Structural Assessment of Tower C and strengthening of distress members were presented to AWHO with recommendation. GEC provided the capacity and demand of columns and Shear walls for few floors only for the distress condition and **there is no information provided on horizontal floor plate structural components such as beams & slabs, also foundation and retaining walls of tower C.**

In the review report on Structural Assessment done by GEC and BV recommended that the entire building to be reassessed in view of the time lapses from the condition assessment and strengthening shall not be limited to only two floors i.e., for Basement & Ground Floor.

AWHO appointed BV to reassess the entire building health condition and propose strengthening of structural components appropriately to enhance the life and predict the residual life.

## 3. SCOPE OF WORK AND EXCLUSION

### 3.1 PART A: VISUAL INSPECTION

1) Visual inspection to assess the condition of the structure. All the structural elements above the basement level, at least 70% of the elements to be inspected based on site situation
2) Identifying any signs of structural distress and deformation, any signs of material deterioration.
3) Preparation of visual inspection report along with observation, photographs and propose the NDT test plan for of distressed members for further evaluation.

### 3.2 PART B: NDT TEST

**Tests on RC members/Concrete:**

1) Dimensional verification of the existing structural members with existing asbuilt drawings for theoretical verification.
2) Carrying out Ultrasonic Pulse Velocity Test on distressed and all accessible RC members at all floors for assessment of quality/in-situ strength of concrete as per **IS 516 Part 5/Sec-1:2018.**
3) Carrying out Rebound Hammer Test on distressed and all accessible RC members at all floors for assessment of surface hardness and strength of concrete as per **IS 516 Part 5/Sec-4:2020.**

4) Carrying out Cover meter Test on distressed and all accessible RC members at all floors for detecting disposition of re-bars and thickness of cover concrete provided as **IS 1881Part 204:1988.**

5) Carrying out Half-Cell Potential measurement test on distressed and identified RC members to assess the extent of corrosion & mapping of corrosion as per **IS 516 Part 5/Sec-2:2021.**

6) Carrying out carbonation test on randomly identified RC members to assess the depth of carbonation in cover concrete as per **IS 516 Part 5/Sec-3:2021.**

7) Carrying out chemical analysis of concrete for assessment of chloride content as per IS: 14959 part II-2001, Sulphate Content as per **BS: 1881 (Part 124) – 2015 a**nd pH value as per **IS: 2720 (Part 26): 1987 (RA 2021)** of concrete through samples collected at site.

8) Carrying out electrical resistivity test (resipod test) on RC members to estimate the likelihood of corrosion

***NDT on RC structural elements will be done with random sampling covering Columns, Shear walls, Beams and slabs. The structural members NDT location shall be decided based on visual inspections.***

## 3.3 PART C: THEORETICAL VERIFICATION AND DESIGN CHECK

Theoretical Evaluation and Structural Assessment for Tower B & C, Tower A is not included in the scope of work. As reported by AWHO team building was constructed and completed in the year 2016. The design of the building shall comply with prevailing IS codes during construction of the building, IS codes to be followed in Structural Assessment of Tower B & Tower C are listed in next class.

**REFERENCE CODES & STANDARDS**

a) **IS 456: 2000** – Code of Practice for Plain & Reinforced Concrete

b) **IS 875: Part 1: 1987** – Code of practice for design loads (Other than Earthquake) for buildings & Structures

c) **IS 875: Part 2: 1987** – Code of practice for design loads (Other than Earthquake) for buildings & Structures

d) **IS 875: Part 3: 2015** – Code of practice for design loads (Other than Earthquake) for buildings & Structures

e) **IS 1893: Part 1– 2002** Criteria for Earthquake Resistant Design of Structures.

f) **IS 13920: 1993 –** Code of Practice for Ductile Design & Detailing of Reinforced Concrete Structures Subjected to Seismic Forces

g) Strengthening Codes & Literature.

h) Nondestructive Test Codes

1) Carrying out three-dimensional analysis of the structural system of the structure using appropriate analysis and software- ETABS

2) Carrying out theoretical analysis & design check of the members for critical load combinations present loading & compliance with prevailing seismic conditions.

a) Evaluation of Foundation

b) Evaluation of Columns & Shear Walls-All Floors

c) Evaluation of Slabs of Floors (Random sampling)

d) Evaluation of Beams for Floors (Random sampling)

e) Evaluation of Staircase

**Details required for AWHO**

The following soft copy and hardcopies are required from AWHO for Tower B & C

1. Survey Report of the area
2. Soil Test Report
3. Final Architectural Drawings
4. Final Structural Framing Drawings / GA drawings
5. Structural Drawings – Reinforcement Drawings of Structural components
   a) Pile layout and details
   b) Pile cap details
   c) Plinth Beam Details
   d) Column & Shear Walls
   e) Slabs and Beams Reinforcement details all floors
   f) Staircase Details

## 3.4 PART D: RESTORATION MEASURES.

a) Suggesting appropriate restoration measures for repairs and rehabilitation works based on NDT results and Theoretical Analysis and Design Check.

b) Scheme and Sketches for Repairs & Rehabilitation.

### 3.5 PART E: PREPARATION OF TENTATIVE COST ESTIMATE (BOQ)

Based on the proposed repairs and restoration measures, preparation of bill of quantities for material and labour component for proposed repair/strengthening work. The BOQ may vary +/- 15 % by quantity as per site condition and will be as per prevailing market rates Suggestion of Material Specifications for the repairs and rehabilitation works.

### 3.6 EXCLUSION

a) Evaluation of MEP service
b) Evaluation of Finishes and other
c) Execution/ supervision of strengthening works

## 4.0 PHYSICAL OBSERVATIONS

Following are the physical observations made consequent to the detailed inspection of Common Basement and Tower C.

***COMMON BASEMENT FLOOR (TOWER B AND C):***

a) No visible signs of settlement in the foundation system were observed in any part of the structure.
b) Severe leakage/dampness was observed in the peripheral retaining wall at isolated locations. Further, these leakage regions were observed to be treated by the grouting technique. Despite this, leakages are persisting in these locations.
c) Cracks were observed in RC columns, beams & corbel/bracket at few locations.
d) Cracks were observed in RC beams at the duct region at most of the locations.
e) Cracks were observed along the construction joint in the ceiling slab at few locations.
f) Leakages were observed from leaky sanitary pipelines leads to splashing of water on RC column surface & stagnation close to the column at floor level.
g) Patch-up repair works were observed in RC columns, beams & ceiling slab panels at few locations.
h) Peeling of paint & dampness/damp patches were observed in the RC ceiling slab panels at few locations.

Pressure grouting treatment was observed to be carried out in RC slab panels to arrest the leakage at many locations.

i) Surface drainage system connected with a network of pipelines (embedded in the floor concrete) to a common sump to drive out seepage water from floor slab was observed in basement floor.

**(Refer General Layout Sketch DWG.REF. No.GL/BF/TC-01 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM-BF-01, NO.DM.BFa-01)**

***LIFT OF TOWER- C: BASEMENT FLOOR***

**Lift No. 01:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 03:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 05:** Minor cracks and debond of plaster were observed at isolated location.

***LIFT OF TOWER- B: BASEMENT FLOOR***

**Lift No. 01:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 03:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 05:** Minor cracks and debond of plaster were observed at isolated location.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/BF/TC -01)**

***GROUND FLOOR:***

- Cracks were observed in RC columns, beams, ceiling slab and staircase waist slab at most of the locations.
- Cracks in masonry wall were observed at isolated locations.
- cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Patch-up repair works were observed on RC columns, beams, ceiling slab & masonry walls at few locations.
- Peeling of paint & dampness/damp patches were observed in the RC ceiling slab and beams at few locations.

- Popping up of marble flooring were observed at most of the locations.

  Debond of granite cladding around lift shear wall was observed at few locations.

  **(Refer General Layout Sketch DWG.REF. No.GL-GF-02 and**

  **Refer Distress Mapping Sketch DWG.REF. No.DM-GF-TC-02)**

  **Lift No. 01:** Minor cracks and debond of plaster were observed at isolated location.

  **Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.

  **Lift No. 03:** Moderate cracks and debond of plaster were observed at isolated locations.

  **Lift No. 04:** Minor to moderate cracks and debond of plaster were observed at few locations.

  **Lift No. 05:** Minor to moderate cracks and debond of plaster were observed at few locations.

  **(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/GF/TC -02)**

***FIRST FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0101 & C-0104.
- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks in masonry wall were observed at isolated locations.
- cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the RC ceiling slab at isolated locations.

  **(Refer General Layout Sketch DWG.REF. No.GL/1F/TC/03 and**

  **Refer Distress Mapping Sketch DWG.REF. No.DM/1F/TC-03)**

**Lift No. 01:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 03:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 04:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 05:** Minor to moderate cracks and debond of plaster were observed at few locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/1F/TC -03)**

***SECOND FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0201, C-0202, C-0203 & C-0204.
- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.

  Peeling of paint & dampness/damp patches were observed in the RC Column at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/2F/TC-04 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/2F/TC-04)**

**Lift No. 01:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 03:** Minor to major cracks and debond of plaster were observed at isolated locations.

**Lift No. 04:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 05:** Minor to major cracks and debond of plaster were observed at isolated locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/2F/TC -04)**

***THIRD FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0301, C-0302, C-0303 & C-0304.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/3F/TC-05 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/3F/TC-05)**

**Lift No. 01:** Minor to moderate cracks and debond of plaster were observed at isolated locations.
**Lift No. 02:** Moderate to major cracks and debond of plaster were observed at few locations.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Moderate to major cracks and debond of plaster were observed at few locations.
**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/3F/TC -05)**

***FOURTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0401, C-0403 & C-0404.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.

- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/4F/TC-06 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/4F/TC-06)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 02:** Moderate to major cracks and debond of plaster were observed at few locations.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Moderate to major cracks and debond of plaster were observed at few locations.
**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/4F/TC -06)**

***FIFTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flat of C-0504.
- Patch-up repair works were observed in staircase RC waist slab & chejjas at few locations.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.

**(Refer General Layout Sketch DWG.REF. No.GL/5F/TC-07 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/5F/TC-07)**
**Lift No. 01:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/5F/TC -07)**

***SIXTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0601, C-0603 & C-0604.
- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at few locations.

**(Refer General Layout Sketch DWG.REF. No.GL/6F/TC-08 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/6F/TC-08)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Minor cracks and debond of plaster were observed at few locations.

**Lift No. 03:** No distress were observed.

**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/6F/TC -08)**

***SEVENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0701 & C-0702.
- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks in masonry wall were observed at isolated locations.

- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/7F/TC-09 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/7F/TC-09)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Minor to moderate cracks and debond of plaster were observed at few locations.
**Lift No. 05:** Minor to moderate cracks and debond of plaster were observed at few locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/7F/TC -09)**

***EIGHTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0801, C-0802, C-0803 & C-0804.
- Patch-up repair works were observed in staircase RC waist slab, chejjas & parapet wall at few locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/8F/TC-10 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/8F/TC-10)**

**Lift No. 01:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 04:** No distress were observed.

**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/8F/TC -10)**

***NINTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-0901, C-0902, C-0903 & C-0904.
- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at most of the locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at few locations.

**(Refer General Layout Sketch DWG.REF. No.GL/9F/TC-11 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/9F/TC-11)**

**Lift No. 01:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 03:** Minor to moderate cracks and debond of plaster were observed at few locations.

**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.

**Lift No. 05:** Minor cracks and debond of plaster were observed at isolated locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/9F/TC -11)**

***TENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at few locations.
- Popping up of granite flooring were observed at few locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-1001, C-1003 & C-1004.
- Patch-up repair works were observed in staircase RC waist slab & RC beam at few locations.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at few locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/10F/TC-12 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/10F/TC-12)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 02:** Minor to moderate cracks and debond of plaster were observed at few locations.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 05:** Minor cracks and debond of plaster were observed at few locations.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/BF/TC -12)**

***ELEVENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-1101, C-1102, C-1103 & C-1104.
- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks in masonry wall & separation cracks were observed at isolated locations.

- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at few locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/11F/TC-13 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/11F/TC-13)**

**Lift No. 01:** Minor cracks and debond of plaster were observed at isolated location.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Minor cracks and debond of plaster were observed at few locations.
**Lift No. 05:** No distress were observed.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/BF/TC -13)**

***TWELFTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at most of the locations inside the flats of C-1201, C-1202, C-1203 & C-1204.
- Patch-up repair works were observed in staircase RC waist slab & Ceiling slab at few locations.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at few locations.

**(Refer General Layout Sketch DWG.REF. No.GL/12F/TC-14 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/12F/TC-14)**

**Lift No. 01:** Minor cracks and debond of plaster were observed at isolated location.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at isolated location.

**Lift No. 05:** Moderate cracks and debond of plaster were observed at isolated location.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/BF/TC -14)**

***THIRTEENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at most of the locations.
- Popping up of granite flooring were observed at most of the locations in common area.
- Popping up of tiles were observed at isolated locations inside the flats of C-1301, C-1303 & C-1304.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at few locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/13F/TC-15 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/13F/TC-15)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 02:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 05:** Minor cracks and debond of plaster were observed at few locations.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/13F/TC -15)**

***FOURTEENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at few locations.
- Popping up of granite flooring were observed at few locations in common area.
- Popping up of tiles were observed at few locations inside the flats of C-1402 & C-1403.
- Cracks in masonry wall & separation cracks were observed at isolated locations.
- Cracks were observed in RC columns, beams, ceiling slab, staircase waist slab & chejjas at few locations.

- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

  **(Refer General Layout Sketch DWG.REF. No.GL/14F/TC-16 and**
  **Refer Distress Mapping Sketch DWG.REF. No.DM/14F/TC-16)**

  **Lift No. 01:** Moderate cracks and debond of plaster were observed at isolated location.
  **Lift No. 02:** Moderate cracks and debond of plaster were observed at isolated location.
  **Lift No. 03:** Moderate cracks and debond of plaster were observed at isolated location.
  **Lift No. 04:** Moderate cracks and debond of plaster were observed at isolated location.
  **Lift No. 05:** No distress were observed.
  **(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/14f/TC -16)**

***FIFTEENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at isolated locations.
- Popping up of tiles were observed at isolated location inside the flats of C-1502.
- Cracks were observed in RC ceiling slab & staircase waist slab at few locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

  **(Refer General Layout Sketch DWG.REF. No.GL/15F/TC-17 and**
  **Refer Distress Mapping Sketch DWG.REF. No.DM/15F/TC-17)**

  **Lift No. 01:** No distress were observed.
  **Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.
  **Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
  **Lift No. 04:** No distress were observed.
  **Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.
  **(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/15F/TC -17)**

***SIXTEENTH FLOOR:***

- Popping up of granite flooring were observed at few locations in common area.
- Popping up of tiles were observed at isolated locations inside the flats of C-1601, C-1602, C-1603 & C-1604.
- Patch-up repair works were observed in staircase RC waist slab at isolated location.

- Cracks were observed in RC columns & staircase waist slab at few locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/16F/TC-18 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/16F/TC-18)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 05:** No distress were observed.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/16F/TC -18)**

***SEVENTEENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at few locations.
- Popping up of granite flooring were observed at isolated location in common area.
- Popping up of tiles were observed at isolated locations inside the flats of C-1701, C-1702 & C-1703.
- Cracks were observed in RC columns & staircase waist slab at isolated locations.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/17F/TC-19 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/17F/TC-19)**

**Lift No. 01:** No distress were observed.
**Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** Minor cracks and debond of plaster were observed at isolated location.
**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/17F/TC -19)**

***EIGHTEENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at isolated locations.
- Popping up of tiles were observed at isolated locations inside the flats of C-1802 & C-1804.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/18F/TC-20 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/18F/TC-20)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** No distress were observed.
**Lift No. 05:** Moderate cracks and debond of plaster were observed at few locations.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/18F/TC -20)**

***NINETEENTH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at isolated location.
- Popping up of tiles were observed at isolated location inside the flat of C-1901
- Patch-up repair works were observed in RC shear wall at isolated location.
- Cracks were observed in RC chejja at isolated location.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.

**(Refer General Layout Sketch DWG.REF. No.GL/19F/TC-21 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/19F/TC-21)**

**Lift No. 01:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 02:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 05:** No distress were observed.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/19F/TC -21)**

***TWENTIETH FLOOR:***

- Debond of granite cladding around lifts shear wall were observed isolated locations.
- Cracks were observed in RC staircase waist slab at isolated location.
- Cracks in masonry wall were observed at isolated locations.
- Cracks were observed at the junction of RC members and masonry walls at isolated locations.
- Any other major distress features were not observed other than the above mention distress in this floor.
- Flat No. C-2004 was not inspected due to non-availability of the occupant.

  **(Refer General Layout Sketch DWG.REF. No.GL/20F/TC-22 and**
  **Refer Distress Mapping Sketch DWG.REF. No.DM/20F/TC-22)**

**Lift No. 01:** No distress were observed.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 04:** Moderate cracks and debond of plaster were observed at few locations.
**Lift No. 05:** Moderate cracks and debond of plaster were observed at isolated location.
**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/20F/TC -22)**

***TWENTY FIRST FLOOR:***

- Popping up of tiles were observed at isolated location inside the flat of C-2101.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations.
- Any other major distress features were not observed other than the above mention distress in this floor.
- Flat No. C-2104 was not inspected due to non-availability of the occupant.

  **(Refer General Layout Sketch DWG.REF. No.GL/21F/TC-23and**
  **Refer Distress Mapping Sketch DWG.REF. No.DM/21F/TC-23)**

**Lift No. 01:** No distress were observed.
**Lift No. 02:** Moderate cracks and debond of plaster were observed at isolated location.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** No distress were observed.

**Lift No. 05:** Moderate cracks and debond of plaster were observed at isolated location.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/21F/TC -23)**

***TWENTY SECOND FLOOR:***

- Debond of granite cladding around lifts shear wall were observed at isolated location.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated location.
- Any other major distress features were not observed other than the above mention distress in this floor.

**(Refer General Layout Sketch DWG.REF. No.GL/22F/TC-24 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/22F/TC-24)**

**Lift No. 01:** No distress were observed.

**Lift No. 02:** No distress were observed.

**Lift No. 03:** No distress were observed.

**Lift No. 04:** No distress were observed.

**Lift No. 05:** No distress were observed.

***TWENTY THIRD FLOOR:***

- Cracks in masonry wall & separation cracks were observed at isolated location inside the flat of C-2301.
- Cracks were observed in RC staircase waist slab at isolated location.
- Any other major distress features were not observed other than the above mention distress in this floor.

**(Refer General Layout Sketch DWG.REF. No.GL/23F/TC-25 and**
**Refer Distress Mapping Sketch DWG.REF. No.DM/23F/TC-25)**

**Lift No. 01:** No distress were observed.

**Lift No. 02:** No distress were observed.

**Lift No. 03:** Minor to moderate cracks and debond of plaster were observed at isolated location.

**Lift No. 04:** No distress were observed.

**Lift No. 05:** No distress were observed.

**(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/23F/TC -25)**

***TWENTY FOURTH FLOOR:***

No major distress features were observed in this floor.

**(Refer General Layout Sketch DWG.REF. No.GL/24F/TC-26 and Refer Distress Mapping Sketch DWG.REF. No.DM/24F/TC-26)**

**Lift No. 01:** No distress were observed.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** No distress were observed.
**Lift No. 05:** No distress were observed.

***TWENTY FIFTH FLOOR:***

- Peeling of paint & dampness/damp patches were observed in the masonry wall at isolated locations inside the flat of C-2503.
- Any other major distress features were not observed other than the above mention distress in this floor.

**(Refer General Layout Sketch DWG.REF. No.GL/24F/TC-26 and Refer Distress Mapping Sketch DWG.REF. No.DM/24F/TC-26)**

**Lift No. 01:** No distress were observed.
**Lift No. 02:** No distress were observed.
**Lift No. 03:** No distress were observed.
**Lift No. 04:** No distress were observed.
**Lift No. 05:** No distress were observed.

***TWENTY SIXTH FLOOR:***

- Patch-up repair works were observed in staircase RC waist slab at few locations.
- Cracks in masonry wall & separation cracks were observed at few locations inside the flats of C-2601, C-2602, C-2603 & C-2604.
- Peeling of paint & dampness/damp patches were observed in the masonry wall at few locations.

- Any other major distress features were not observed other than the above mention distress in this floor.

  **(Refer General Layout Sketch DWG.REF. No.GL/26F/TC-28 and Refer Distress Mapping Sketch DWG.REF. No.DM/26F/TC-28)**

  **Lift No. 01:** No distress were observed.
  **Lift No. 02:** No distress were observed.
  **Lift No. 03:** No distress were observed.
  **Lift No. 04:** No distress were observed.
  **Lift No. 05:** Minor cracks and debond of plaster were observed at isolated location.
  **(Refer Distress Mapping Sketch DWG.REF. No.DM/LW/26F/TC -25)**

***TWENTY SEVENTH FLOOR AND HELIPAD:***

- Peeling of paint & condensation stains were observed in the RC members at few locations.
- Any other major distress features were not observed other than the above mention distress in this floors.

  **(Refer General Layout Sketch DWG.REF. No.GL/27F/TC-29 and Refer Distress Mapping Sketch DWG.REF. No.DM/2F/TC-29)**

**Refer DWG.REF. No.DM/EL/TC-01 TO 04 for distress mapping of external surfaces of tower**

## 5.0 PROBING TESTS.

In order to assess the extent of distress & to assess the quality/strength of concrete in RC members of Tower – C following probing tests/studies were resorted to.

**5.1 Preparation of distress mapping sketches by visual inspection and Drone Survey.**

**5.2 Non-destructive Ultrasonic Pulse Velocity quality and integrity of concrete in RC members.**

**5.3 Non-destructive Rebound Hammer test to assess the surface hardness of concrete nearer to the surface in RC members**

**5.4 Cover meter studies to measure the thickness of cover concrete.**

**5.5 Semi-Destructive test to assess the strength of concrete in RC Columns, Beams &Slab.**

**5.6 Half-cell potential measurement test on RC members to assess the probability of**

**corrosion.**

**5.7 Carbonation test on RC members to assess the loss of alkalinity in concrete.**

**5.8 Chemical Analysis on concrete samples to assess.**

**a. Chloride content**

**b. Sulphate content**

**5.9 Chemical Analysis on concrete samples for determination of pH value.**

**5.10 Electrical Resistivity of Concrete using Resipod to determine the likelihood of corrosion.**

**5.11 Infrared Thermography on distressed regions to assess the extent and source of dampness in RC members.**

**5.12 Test on water sample.**

**Note:**

**a.** Three Bore-Hole Points were reported with in the premises of the apartment. At present all were reported to be closed/not in use. Since the bore wells not in operation water couldn't be collected and tested.

**b.** The water surrounding/vicinity of apartment is reported to be a sea back water. Hence chloride content test from this source was not found necessary.

**c.** Attempt to evaluate the strength/quality of pile and pile caps were made, but due to presence of high-water table evaluation below couldn't be carried out. During the process of evaluation water started oozing out from the floor slab. Oozed out water from the flooring was collected and subjected to test to understand the impact of water on the pile foundation.

**5.1 Preparation of layouts for distress mapping sketches by visual inspection and Drone Survey.**

A detailed visual inspection of the entire structure was carried out to map the distress in the existing structural and non-structural members of the building.

Drone survey was carried out to on the external surface of the building to view the manually inaccessible distressed regions. By verify the drone videos on all four sides of the structure the distress mapping on elevation sketches has been carried out.

The distress mapping sketches has been appended in the Annexure and videos of the drone survey is also appended as a DVD enclosure.

## 5.2 Non-destructive Ultrasonic Pulse Velocity quality and integrity of concrete in RC members.

Ultrasonic Pulse Velocity test was conducted on RC members at random to assess the quality and integrity of concrete in RC members of Tower C and common basements. The test was conducted using "PUNDIT Lab+" (Portable Ultrasonic Non-destructive Digital Indicating Tester) equipment from M/s. Proceq, Switzerland as per the guidelines in Indian Standard **IS: 516(Part-5/Sec1)-2018 (Amendment –November 2019).** Direct & Indirect method of test was adopted at the site for scanning. The results of the test are tabulated in **Test Report and the corresponding quality grading chart has been appended for reference.**

The Ultrasonic Pulse Velocity Floor/member-wise test results indicate that the quality of concrete in the tested RC members **as per clause 2.5.2 of IS: 516(Part 5/Sec1)-2018 (Amendment – November 2019)** are found to be as follows :

***COMMON BASEMENT FLOOR – TOWER-B AND C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.
- RC Corbels fall fall under the category of **"Doubtful to Good"** concrete.

***GROUND FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***FIRST FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***SECOND FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***THIRD FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***FOURTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***FIFTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***SIXTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***SEVENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***EIGHTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***NINTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***ELEVENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWELFTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.

- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***THIRTEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***FOURTEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***FIFTEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***SIXTEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***SEVENTEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***EIGHTEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***NINETEENTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTIETH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful"** concrete
- RC Beams fall under the category of **"Doubtful"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTY FIRST FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTY SECOND FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTY THIRD FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTY FOURTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTY FIFTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

***TWENTY SIXTH FLOOR – TOWER-C***

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Good"** concrete.
- RC Shear Wall fall under the category of **"Doubtful to Good"** concrete.

**TWENTY SEVENTH & HELIPAD FLOOR – TOWER-C**

- RC Columns fall under the category of **"Doubtful to Good"** concrete
- RC Beams fall under the category of **"Doubtful to Good"** concrete.
- RC Slab fall under the category of **"Doubtful to Good"** concrete.

### 5.3 Non-destructive Rebound Hammer test to assess the surface hardness of concrete nearer to the surface in RC members

Rebound Hammer Test was carried out on RC slab and shear wall of common basement floor of Tower B & C and all floor slabs of Tower-C at random to assess the surface hardness/strength of concrete nearer to surface. The test was conducted using Schmidt Rebound Hammer from M/s. Proceq, Switzerland as per the guidelines in Indian Standard IS: 516 (Part5/Sec4)-2020. The position of the hammer was vertically upwards during the test. The results of the test are tabulated in **Test Report and the corresponding reference strength chart has appended.**

From the results of the Rebound Hammer test, it is indicated that the estimated compressive strength of concrete nearer to surface in the tested RC slabs and shear walls is found to be as detailed below.

***COMMON BASEMENT FLOOR – TOWER-B AND C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **34 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **26 N/mm$^2$.**

***GROUND FLOOR – TOWER-C***

RC Slab – Found to be in the range of **18 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***FIRST FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **30 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***SECOND FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **30 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***THIRD FLOOR – TOWER-C***

RC Slab – Found to be in the range of **26 N/mm$^2$** to **30 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***FOURTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **26 N/mm$^2$** to **30 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***FIFTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **16 N/mm$^2$.**

***SIXTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **34 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***SEVENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **26 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***EIGHTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be **10 N/mm$^2$.**

***NINTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **22 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

**TENTH FLOOR – TOWER-C**

RC Slab – Found to be in the range of **26 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***ELEVENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **30 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***TWELFTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **24 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***THIRTEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **18 N/mm$^2$** to **32 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***FOURTEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **26 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **14 N/mm$^2$.**

***FIFTEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **26 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **14 N/mm$^2$.**

***SIXTEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **26 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***SEVENTEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **24 N/mm$^2$** to **30 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***EIGHTEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **18 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***NINETEENTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **26 N/mm$^2$** to **34 N/mm$^2$.**

RC Shear Wall – Found to be **10 N/mm$^2$.**

***TWENTIETH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **26 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***TWENTY FIRST FLOOR – TOWER-C***

RC Slab – Found to be in the range of **22 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***TWENTY SECOND FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **32 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***TWENTY THIRD FLOOR – TOWER-C***

RC Slab – Found to be in the range of **24 N/mm$^2$** to **28 N/mm$^2$.**

RC Shear Wall – Found to be **10 N/mm$^2$.**

***TWENTY FOURTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **32 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

***TWENTY FIFTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **20 N/mm$^2$** to **24 N/mm$^2$.**

RC Shear Wall – Found to be **10 N/mm$^2$.**

***TWENTY SIXTH FLOOR – TOWER-C***

RC Slab – Found to be in the range of **18 N/mm$^2$** to **24 N/mm$^2$.**

RC Shear Wall – Found to be in the range of **10 N/mm$^2$** to **12 N/mm$^2$.**

## 5.4 Cover meter studies to measure the thickness of cover concrete.

Cover meter studies were carried out on various RC members in order to assess the thickness of cover concrete peripheral rebars in the RC members. The test was conducted using Profometer-5+ from M/s. Proceq, Switzerland as per the guidelines furnished by the

manufacturer's manual. The results of the tests are tabulated in **Test Report.**

The cover meter study revealed that the cover concrete provided to the rebars were observed to be inadequate at most of the locations.

## 5.5 Semi-Destructive test to assess the strength of concrete in RC members of Common Basement floor & Tower C.

Semi-Destructive test such as core test was resorted to in order to assess the strength of concrete in identified RC members of tower-C and common basement of Tower-B& C. **Forty five concrete samples** were extracted from RC Columns at randomly selected locations from Tower-C and Common Basement floor in Tower B & C. Prior to core extraction profometer scanning was carried out on identified RC members to avoid cutting of rebars.

The extracted core samples were subjected to compressive strength test after necessary edge trimming and capping as per guidelines in Indian standard **IS: 516-Part 4(2018).**

The extracted core samples were observed to be homogeneous and free from any voids/ porosities. The results of the test are tabulated in **Test Report.**

**Following are the Tower/ Floor /Member-wise results:**

***COMMON BASEMENT FLOOR – TOWER B & C***

RC Columns -Compressive strength ranges from **21.8 N/mm$^2$** to **37.3 N/mm$^2$**

RC Beams -Compressive strength ranges from **26.6 N/mm$^2$** to **43.4 N/mm$^2$**

RC Shear Wall -Compressive strength ranges from **23.9 N/mm$^2$** to **35.0 N/mm$^2$**

***GROUND FLOOR – TOWER C***

RC Columns -Compressive strength ranges from **21.9 N/mm$^2$** to **34.3 N/mm$^2$**

RC Beams -Compressive strength ranges from **26.0 N/mm$^2$** to **28.6 N/mm$^2$**

***SECOND FLOOR– TOWER C***

RC Beam -Compressive strength ranges from **24.7 N/mm$^2$** to **37.9 N/mm$^2$**

RC Slab -Compressive strength ranges from **25.9 N/mm$^2$ to 42.3 N/mm$^2$**

RC Staircase Waist Slab -Compressive strength is **29.5 N/mm$^2$**

***FIFTH FLOOR– TOWER C***

RC Columns -Compressive strength is **16.9 N/mm$^2$**

RC Slab -Compressive strength is **33.9 N/mm$^2$**

***SEVENTH FLOOR– TOWER C***

RC Shear Wall -Compressive strength is **26.2 N/mm$^2$**

RC Slab -Compressive strength is **34.7 N/mm$^2$**

***TWELFTH FLOOR– TOWER C***

RC Beam -Compressive strength is **22.3 N/mm$^2$**

***FOURTEENTH FLOOR– TOWER C***

RC Column -Compressive strength is **20.3 N/mm$^2$**

***TWENTY FORTH FLOOR– TOWER C***

RC Shear Wall -Compressive strength is **24.7 N/mm$^2$**

**Acceptance Criteria (As per clause 17.4.3 of IS: 456-2000)**

As per **Clause 17.4.3 of IS:456-2000**, concrete in the member represented by a core test shall be considered if the average equivalent cube strength of the cores is equal to at least 85% of the cube strength of the grade of concrete specified for the corresponding age & no individual core has a strength less than 75%.

## 5.6 Half-cell potential measurement test on RC members to assess the probability of corrosion.

Half-Cell Potential Measurement Test was carried out on Common Basement floor of Tower-B & C and RC members of Tower-C at random by using Copper-Copper Sulphate Half-Cell to assess the probability of corrosion in reinforcing bars. The test was conducted using **CANIN** equipment from **M/s. Proceq, Switzerland** as per the guidelines in **ASTM C876-15 (Reapproved 2015)** &furnished by the manufacturer's manual.

The results of the test are tabulated in **Test Report &** the corresponding reference chart is appended

The results of the test indicate that the Probability of corrosion in tested RC members is found to be as detailed below.

**Following are the Tower/ Floor /Member-wise results:**

***COMMON BASEMENT FLOOR – TOWER B & C***

- RC Columns - **Low Probability of Corrosion to High Probability of Corrosion**
- RC Beams - **Uncertainty of Corrosion to High Probability of Corrosion**
- RC Corbels -**Low Probability of Corrosion to Uncertainty Probability of Corrosion**

***GROUND FLOOR-TOWER-C***

- RC Columns - **Uncertainty of Corrosion to High Probability of Corrosion**
- RC Beams - **Uncertainty of Corrosion**

***TENTH FLOOR- TOWER-C***

- RC Shear Wall - **Uncertainty of Corrosion to High Probability of Corrosion**
- RC Beams - **Uncertainty of Corrosion**

***THIRTEENTH FLOOR- TOWER-C***

- RC Staircase Waist Slab - **Uncertainty of Corrosion**

## 5.7 Carbonation test on RC members to assess the loss of alkalinity in concrete.

Carbonation test was carried out on RC members at common Basement and Tower-C at random using **phenolphthalein indicator of 1gm dissolved in 100 ml solution of 70 ml ethanol & 30 ml of de-ionised water. Dilute Alcohol added with Phenolpthalein indicator** to assess the loss of alkalinity in cover concrete. The test was conducted as per the guidelines in **IS: 516 (Part 5/Sec 3) : 2021.** The results of the test are tabulated in **Test Report.**

The results of the test indicate that the measured depth of carbonation in the tested RC members is found to be as detailed below.

**Following are the Tower/ Floor /Member-wise results:**
***COMMON BASEMENT FLOOR – TOWER B & C***

- RC Columns – 20 mm to 50 mm
- RC Beams - 25mm to 40mm
- RC Shear Wall – 30mm to 35 mm

***GROUND FLOOR-TOWER C***

- RC Columns - 28 mm to 48 mm
- RC Beams - 20 mm to 35 mm

***SECOND FLOOR-TOWER C***

- RC Beams - 15 mm to 25 mm
- RC Slab - 10 mm to 15 mm
- RC Staircase Waist Slab – 15 mm to 20 mm

***FIFTH FLOOR-TOWER C***

- RC Column - 35 mm to 40 mm
- RC Slab - 8 mm to 12 mm

***SEVENTH FLOOR-TOWER C***

- RC Shear Wall - 22 mm to 28 mm
- RC Slab - 12 mm to 18 mm

***TWELFTH FLOOR -TOWER C***

- RC Beam - 25 mm to 30 mm

***FOURTEENTH FLOOR- TOWER -C***

- RC Column - 25 mm to 32 mm

***TWENTY FOURTH FLOOR-TOWER C***

- RC Shear Wall - 18 mm to 24 mm

The results of the test indicate that the carbonation front in concrete has reached up to **reinforcement level** in most of the tested RC members indicating that the cover concrete has already lost its alkalinity which is essential to protect the reinforcing bars against potential corrosion.

## 5.8 Chemical Analysis on collected concrete samples to assess.

### a. Chloride content.

Chloride determination test was carried out on concrete samples collected from the

Common Basement floor RC members of Tower B & C and in Tower C at random locations to estimate the level of chlorides in the concrete as per the guidelines in **IS: 14959(Part 2)-2001.**

The presence of higher amount of chlorides in the concrete surrounding the reinforcement will result in corrosion of rebars. The quantity of chlorides in concrete is determined generally by chemical analysis. The results of the test are tabulated in **Test Report.**

The results of the chloride content test in concrete indicate that the level of chlorides in the tested RC members are found to be as detailed below.

**Following are the Tower/ Floor/ Member-wise results:**

***COMMON BASEMENT FLOOR – TOWER B & C***

- RC Column – 0.034 kg/cum to 1.12kg/cum
- RC Beam - 0.034 kg/cum to 0.17 kg/cum
- RC Shear Wall - 0.014 kg/cum to 0.058 kg/cum

***TOWER C – GROUND FLOOR***

- RC Column- 0.058 kg/cum to 0.34 kg/cum
- RC Beam - 0.041 kg/cum to 0.26 kg/cum

***TOWER C – SECOND FLOOR***

- RC Beam - 0.42 kg/cum to 0.60 kg/cum
- RC Slab – 0.63 kg/cum to 0.91 kg/cum
- RC Waist Slab - 0.88 kg/cum

***TOWER C – FIFTH FLOOR***

- RC Column - 0.11 kg/cum
- RC Slab - 0.12 kg/cum

***TOWER C – SEVENTH FLOOR***

- RC Slab - 0.26 kg/cum
- RC Shear Wall - 0.10 kg/cum

***TOWER C – TWELFTH FLOOR***

- RC Beam - 0.10 kg/cum

***TOWER C – FOURTEENTH FLOOR***

- RC Column - 0.10 kg/cum

***TOWER C – TWENTY FOURTH FLOOR***

- RC Shear Wall - 0.11 kg/cum

From the above test results, it is found that the level of Chloride content in the tested RC members is found to be **beyond the permissible limit of 0.6kg/cum in some tested samples and in some samples it is within the permissible limits.**

**b. Sulphate content**

Sulphate determination test in concrete is carried out on concrete samples collected from Common Basement floor RC members of Tower B & C & in Tower C at random to estimate the level of Sulphates in the concrete.

The presence of higher amount of Sulphates in concrete will result in reaction of calcium present in cement with Sulphates, resulting in the deterioration of concrete. The quantity of Sulphates in concrete is determined generally by chemical analysis and is expressed in terms of percentage of Sulphates by weight of concrete. The results of the test are tabulated in **Test Report.**

The results of the Sulphate content test on concrete indicates that the level of Sulphate in the tested RC member was found to be as detailed below.

**Following are the Tower/ Floor/ Member-wise results:**

***COMMON BASEMENT FLOOR – TOWER B & C***

- RC Column – 0.13% to 0.43%
- RC Beam - 0.11% to 0.35%
- RC Shear Wall - 0.12% to 0.42%

***TOWER C – GROUND FLOOR***

- RC Column- 0.24% to 0.45%
- RC Beam - 0.28% to 0.49%

***TOWER C – SECOND FLOOR***

- RC Beam - 0.13% to 0.21%
- RC Slab – 0.11% to 0.14%
- RC Waist Slab - 0.12%

***TOWER C – FIFTH FLOOR***

- RC Column - 0.32%
- RC Slab - 0.17%

***TOWER C – SEVENTH FLOOR***

- RC Slab - 0.22%
- RC Shear Wall - 0.23%

***TOWER C – TWELFTH FLOOR***

- RC Beam - 0.38%

***TOWER C – FOURTEENTH FLOOR***

- RC Column - 0.19%

***TOWER C – TWENTY FOURTH FLOOR***

- RC Shear Wall - 0.28%

From the above test results, it is found that, the level of Sulphate content in the tested RC members are found to be **with in the permissible limit of 4%.**

## 5.9 Chemical Analysis on concrete samples for determination of pH

The level of pH value is carried out on concrete samples collected from Common Basement floor RC members of Tower B & C and Tower C at random & tested as per the guidelines in **NCB 9th International Seminar Vol.3 Page 500 / IS: 2720 (Part 26): 1987 (Reaffirmed 2016).**

The level of pH in fresh concrete is generally in the range of 12 to 14. Due to carbonation, the pH value of concrete will be reduced considerably. When the pH value fall below about 10, the alkalinity of the concrete will not be adequate to protect the rebars against corrosion.

The results of the test are tabulated in **Test Report.**

The pH value of the interior concrete in the tested RC members is found to be as detailed below.

**Following are the Tower/ Floor/ Member-wise results:**

***COMMON BASEMENT FLOOR – TOWER B & C***

- RC Column – 13.64 to 13.92
- RC Beam - 13.61 to 13.85
- RC Shear Wall – 13.83 to 13.92

***TOWER C – GROUND FLOOR***

- RC Column- 13.78 to 13.88
- RC Beam - 13.85 to 13.90

***TOWER C – SECOND FLOOR***

- RC Beam – 13.37 to 13.45
- RC Slab – 13.21 to 13.44
- RC Waist Slab – 13.51

***TOWER C – FIFTH FLOOR***

- RC Column – 13.93
- RC Slab - 13.37

***TOWER C – SEVENTH FLOOR***

- RC Slab – 13.46
- RC Shear Wall - 13.43

***TOWER C – TWELFTH FLOOR***

- RC Beam – 13.38

***TOWER C – FOURTEENTH FLOOR***

- RC Column – 13.47

***TOWER C – TWENTY FOURTH FLOOR***

- RC Shear Wall – 13.49

From the above test results, it is found that, the level of pH content in the tested RC members are found to be **within the desirable limit in Common Basement of Tower B&C and Tower C.**

## 5.10 Electrical Resistivity of Concrete using Resipod to determine the likelihood of corrosion.

Electrical Resisitivity test conducted on RC members to determine the likelihood of corrosion. The Resipod is an evolution of the industry standard CNS Farnell RM MKII resistivity meter, operating on the principle of the Wenner probe.The Resipod is designed to measure the electrical resistivity of concrete. A current is applied to the two outer probes and the potential difference is measured between the two inner probes. The current is carried by ions in the pore liquid. The calculated resistivity depends on the spacing of the probes. Resistivity $\rho = 2\pi aV/I$ [kΩcm] The test was carried out using resipod equipment from M/s. Proceq, Switzerland as per the guidelines of RILEM TC 154-EMC: Electrochemical Techniques for measuring mettalic corrosion and instrument manual. The results of the test tabulated in **Test Report** and corresponding likelihood of corrosion chart.

## 5.11 Infrared Thermography on distressed regions to assess the extent and source of dampness in RC members.

Infrared thermography was conducted to scan the affected damp locations and possible source of leakages in the identified RC walls. Infrared images are captured of the surface and surface temperature were measured to identify the damp spots. The surface having low temperature is shaded by blue color than adjoining areas having higher temperatures.

The suspected surface of RC wall etc. were scanned by infrared thermal imaging.

The temperature gradient of the surface is also given in the scale attached right to the image. The variations of temperature from minimum to maximum of the particular surface can be identified from the infrared images. The dark blue color areas are showing as wet patches near to source of the leakages. The thermal imaging was carried out using infrared camera-Model No. “Flir C5” make by Teledyne FLIR LLC.

The infrared images taken at different locations along with observations are appended in appendix section. The infrared images taken at different locations with grid identification are given from Page 01 to 23.

### 5.12 Test on water sample.

Oozed out water from the flooring was collected and subjected to chemical analysis to understand the impact of water on the pile foundation. The test was conducted as per guide lines of IS 456: 2000, IS3025( Part-11,17, 18): 2022, IS3025( Part-22,23): 1986, IS3025( Part-24/sec-1): 2022, IS3025( Part-32):1988 to verify the suitability of water for construction of plain/ reinforced concrete.

From the results of the water test, it is evident that the water below the grade slab/flooring does not confirms to requirements of IS 456: 2000 for plain/ reinforced concrete construction.

# 6. THEORETICAL VERIFICATION AND DESIGN CHECK

## 6.1 DESIGN BASIS REPORT (DBR)

# contents

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### 6.1.1 ABSTRACT

This document presents the details regarding the structural analysis of the existing building, “Tower – C” of Chanderkunj Army Towers at Silver Sand Island, Kochi. The structural analysis was performed using Etabs V 19. The Mathematical model used for the analysis was prepared using the available good for construction drawings (GFC) of Tower-C provided by AWHO, Kochi.

### 6.1.2 CODES, STANDARDS & PROJECT SPECIFICATION

All the structural elements were analyzed & designed in accordance with the requirements and recommendations of the reference codes and standards prevailing at the time of construction to assess the performance of the existing structure. The reference codes & standards are based on the following documents.

#### 6.1.2.1 REFERENCE CODES & STANDARDS

- IS 456: 2000 – Code of Practice for Plain & Reinforced Concrete
- IS 875: Part 1: 1987 – Code of practice for design loads (Other than Earthquake)for buildings & Structures
- IS 875: Part 2: 1987 – Code of practice for design loads (Other than Earthquake)for buildings & Structures
- IS 875: Part 3: 2015 – Code of practice for design loads (Other than Earthquake)for buildings & Structures
- IS 1893: 2002, Part 1– Criteria for Earthquake Resistant Design of Structures.
- IS 13920: 1993 – Code of Practice for Ductile Design & Detailing of Reinforced Concrete Structures Subjected to Seismic Forces
- Strengthening Codes & Literature.
- NDT Codes

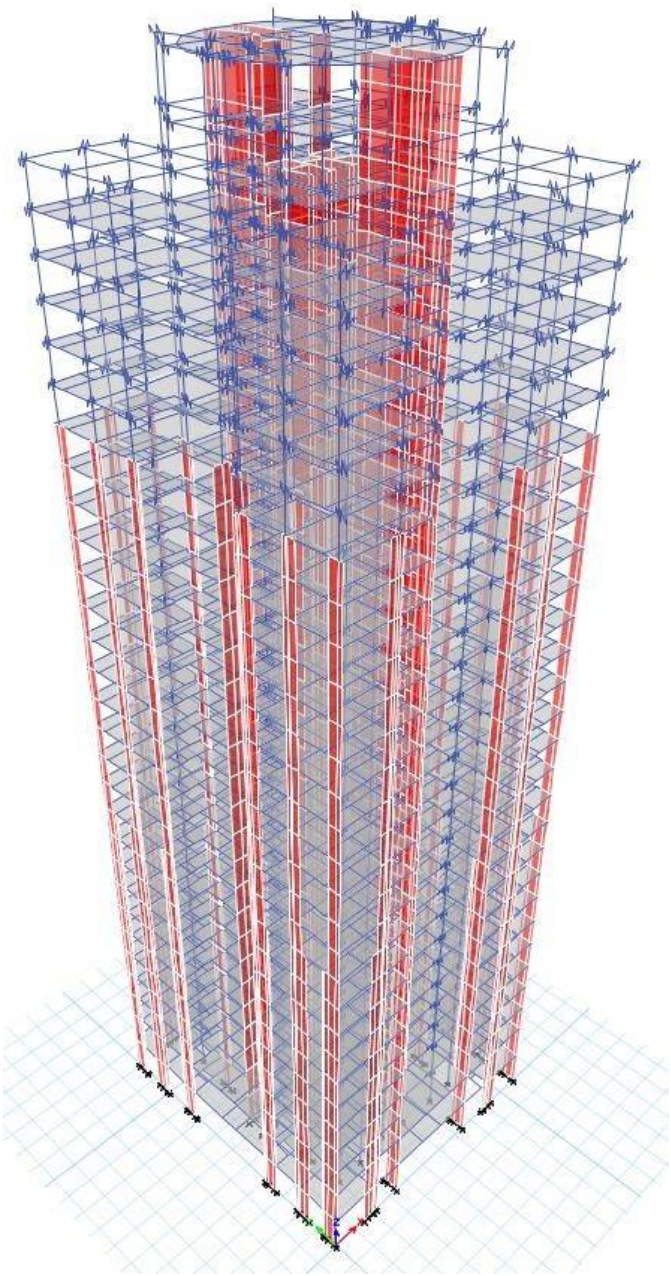
### 6.1.3 PROJECT DESCRIPTION

The objective of this project is to calculate the structural member forces on an existing structure, as per the codes and standards mentioned above, such that a retrofitting strategy can be prepared, which can be used to strengthen the distressed structural members (if required). In order to calculate the force demands on the existing structure, a mathematical model of the existing structure, as shown on “Figure-1”, was made using the structural analysis software Etabs V 19.

The sole intent of this report is to present the loading credentials and assumptions that were made while modelling the mathematical model with the available structural GFC drawings, along with the method of analysis and results that were obtained after the analysis. The analysis results obtained from the mathematical model is used for the design of various structural members, that are present in the building. The mathematical model after analysis and design, which forms the demand data, has be compared with both the original intended capacities of the structural members from the structural GFC drawings and also the calculated probable capacity currently present in the existing structure, after distress. Ultimately, a retrofitting strategy has been proposed, which shall strengthen the existing distressed structure to satisfy the actual force demands.

### 6.1.4 MATHEMATICAL MODEL

## Fig -1– 3D Model



The mathematical model has been modelled using the details provided by the structural drawings submitted by AWHO, Kochi. The columns "C1, C2, C3, C4, C7, C8, C9, C10" from foundation to 22nd storey was modelled as shear walls, since the aspect ratio for these members were greater than '4'.

### 6.1.5 DESIGN LOADS

#### 6.1.5.1 Wall Loads

The wall loads were applied as line load on beams.

1. Height of wall = 3.75m
   - *Load applied for 20cm wall = 13.5 kN/m*
   - *Load applied for 10cm wall = 6.75 kN/m*

2. Height of wall = 2.8m
   - *Load applied for 20cm wall = 10.1 kN/m*
   - *Load applied for 15cm wall = 7.3 kN/m*

3. Height of wall = 2.7m
   - *Load applied for 30cm wall = 14.6kN/m*
   - *Load applied for 20cm wall = 10 kN/m*
   - *Load applied for 15cm wall = 5 kN/m*

4. Parapet Wall, Lift openings & miscellaneous line loads
   - *Load applied = 5 kN/m*

5. Sunshade
   - *Load applied = 1.5 kN/m*

6. Balcony Handrail / Parapet
   - *Load applied = 2.5 kN/m*

#### 6.1.5.2 Floor Loads

1. **GROUND FLOOR**
   - *Live load = 3kN/m$^2$*
   - *Floor finish = 1kN/m$^2$*
   - *Transformer room load = 15kN/m$^2$*

2. **1st FLOOR TO 26th FLOOR (TYPICAL)**
   - *Live load = 2kN/m$^2$*
   - *Floor Finish = 1 kN/m*
   - *Toilet live load =2kN/m$^2$*
   - *Toilet Fill = 3kN/m$^2$*

- *Passage = 3kN/m²*
- *Balcony = 3kN/m²*

**3. TERRACE FLOOR**

- *Roof live = 1.5kN/m²*
- *Roof floor finish = 0.5kN/m²*
- *Lift area live = 3kN/m²*
- *Lift area floor finish = 1kN/m²*

***4. MACHINE ROOM***

- *Machine load = 15kN/m²*
- *Live loads = 3kN/m²*
- *Floor finish = 1kN/m²*

***5. MACHINE FLOOR ROOF***

- *Live load = 3kN/m²*
- *Floor finish = 0.5kN/m²*

***6. HELIPAD***

- *Live load = 10kN/m²*
- *Floor finish = 1kN/m²*

### 6.1.5.3 Staircase Load

- *Stair Live line load = 4kN/m*
- *Stair Dead line load =10kN/m*

### 6.1.5.4 Other Vertical Loads

*Water tank load for Overhead Tank = 32kN/m²*

### 6.1.5.5 Wind Load Parameters (IS 875: Part 3: 2015)

**Table 1 – Wind Loading Parameters**

| PARAMETERS | VALUE |
|---|---|
| Wind Speed, $V_b$ (m/s) | 39 |
| Terrain Category | 2 |
| Importance Factor | 1 |
| Risk Coefficient | 1.06 |
| Topography | 1 |
| Windward Coefficient, $C_p$ | 0.8 |
| Leeward Coefficient, $C_p$ | 0.25 |

### 6.1.5.6 Seismic Load Parameters (IS 1893: 2002- Part1)

**Table 2 – Seismic loading Parameters**

| PARAMETERS | VALUE |
|---|---|
| Seismic Zone Factor, Z | 0.16 |
| Soil Type | II |
| Importance Factor | 1.2 |
| Response Reduction Factor, R | 5 |
| Time period along X-direction | 1.24 |
| Time period along Y-direction | 1.24 |

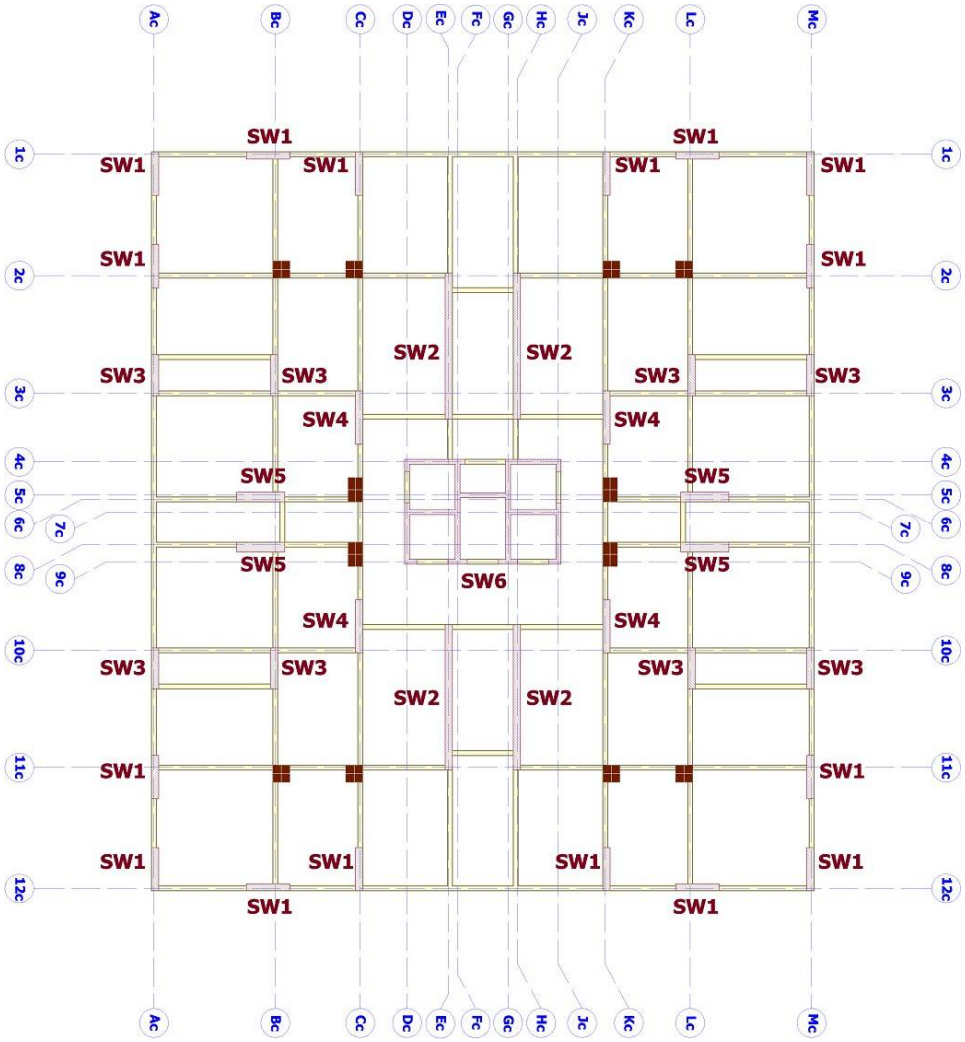



**Fig-2 – Column and Shear Wall layout GF**

The load cases used for the analysis are:

1. Dead - Dead loads including Self weight
2. Live <3 - Live Loads less than 3kN/$m^2$
3. Brick - Wall load on Beam (SIDL)
4. Sunshade - Sunshade Load
5. Roof Live - Live load on roof (Not considered in the mass matrix for modal analysis)
6. Machine - Lift and Transformer loads
7. FF - Floor Finish Load (SIDL)
8. WT - Water load from overhead tank (SIDL)
9. Staircase Dead load - Dead load of Stair applied on beam as Lineload (SIDL)
10. Staircase Live load - Live load of Stair applied on beam as Line load
11. Wind 0 - Wind Load along X – direction
12. Wind 90 - Wind Load along Y – direction
13. Eqx - Equivalent static load case along X – direction
14. Eqy - Equivalent static load case along Y – direction
15. Eqx(+ex) - +ve eccentricity for seismic force along X
16. Eqx(-ex) - -ve eccentricity for seismic force along X
17. Eqy(+ey) - +ve eccentricity for seismic force along Y
18. Eqy(-ey) - -ve eccentricity for seismc force along Y
19. RSPEC - Response Spectrum Load case

The percentage of loads considered in mass matrix for modal analysis is shown below:

Mass = 1× (Dead+Brick+Sunshade+FF+WT+Stair Dead) +0.5× (Machine)
+0.25× (Live<3+Stair Live) Since the location of the building is at seismic zone III,

Dynamic analysis is necessary.

### 6.1.5.7 P-DELTA ANALYSIS

Since this structure falls in the category of Tall building, a second order analysis becomes necessary. Using the software Etabs, an initial p– delta analysis was performed to satisfy this requirement. Since the axial loads due to gravityon buildings are generally constant, the p -delta effects on its structural elements will vary only based on the magnitude of its axial load and its length. The type of axial load on structural members will determine its change in lateral stiffness. When a structural member isin tension, its lateral stiffness increases due to tension stiffening & while during compression,its lateral stiffness reduces due to compression softening. This change in stiffness does not depend on the mechanical property and only depend on the magnitude of axial force and length of the member. Therefore, in order to accommodate this change in lateral stiffness with material stiffness, etabs creates a geometric / stress stiffness matrix, which when combined with the material stiffness matrix, forms the total stiffnes matrix, which accounts the P-delta effects in a linear analysis. Since iteration of load combination is not required in an initial P-delta method, this method can be used for dynamic analysis by using the stiffness matrix after P-delta analysis in the Modal analysis.

In this project, the initial P-delta analysis for the service model was performed with unfactored gravity loads (all dead and live loads). For the design model, the P-delta analysis was performed using a factor of safety of 1.2 on all gravity loads. This load combination can provide a conservative result. Since we account the second order effects from the analysis model itself, it is not required to calculate the stability index.

### 6.1.6 MODAL ANALYSIS RESULTS

The modal analysis on the building bare frame was performed using Eigen method on ETABS V 19. A total of 25 modes were calculated for achieving 90%+ modal mass participation. The modal analysis data is shown on Table 3. The mode shapes of first three eigen modes are shown on Fig : 3, 4 & 5 respectively.

**Table : 3 – Modal analysis results**

| TABLE: Modal Participating Mass Ratios | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Case | Mode | Period sec | UX | UY | UZ | SumUX | SumUY | SumUZ | RX | RY | RZ | Sum RX | Sum RY | Sum RZ |
| Modal | 1 | 5.61 | 0.1 | 0 | 0 | 0.08 | 0 | 0 | 3E-05 | 0.04 | 0.63 | 0.00 | 0.04 | 0.63 |
| Modal | 2 | 4.888 | 0.6 | 0 | 0 | 0.70 | 0 | 0 | 4E-05 | 0.27 | 0.08 | 0.00 | 0.30 | 0.72 |
| Modal | 3 | 4.069 | 0 | 0.69 | 0 | 0.70 | 0.69 | 0 | 0.3134 | 0.00 | 0.00 | 0.31 | 0.30 | 0.72 |
| Modal | 4 | 1.862 | 0 | 0 | 0 | 0.71 | 0.69 | 0 | 4E-06 | 0.02 | 0.11 | 0.31 | 0.33 | 0.83 |
| Modal | 5 | 1.453 | 0.1 | 0 | 0 | 0.84 | 0.69 | 0 | 1E-06 | 0.31 | 0.01 | 0.31 | 0.63 | 0.84 |
| Modal | 6 | 1.151 | 0 | 0.14 | 0 | 0.84 | 0.83 | 0 | 0.307 | 0.00 | 0.00 | 0.62 | 0.63 | 0.84 |
| Modal | 7 | 1.083 | 0 | 0 | 0 | 0.84 | 0.83 | 0 | 0.0004 | 0.00 | 0.04 | 0.62 | 0.64 | 0.88 |
| Modal | 8 | 0.864 | 0 | 0 | 0 | 0.84 | 0.83 | 0 | 5E-05 | 0.00 | 0.00 | 0.62 | 0.64 | 0.88 |
| Modal | 9 | 0.86 | 0 | 0 | 0 | 0.84 | 0.83 | 0 | 4E-05 | 0.00 | 0.00 | 0.62 | 0.64 | 0.88 |
| Modal | 10 | 0.855 | 0 | 0 | 0 | 0.84 | 0.83 | 0 | 3E-05 | 0.00 | 0.00 | 0.62 | 0.64 | 0.88 |
| Modal | 11 | 0.776 | 0 | 0 | 0 | 0.85 | 0.83 | 0 | 0 | 0.01 | 0.00 | 0.62 | 0.65 | 0.88 |
| Modal | 12 | 0.774 | 0 | 0 | 0 | 0.85 | 0.83 | 0 | 4E-06 | 0.00 | 0.00 | 0.62 | 0.65 | 0.88 |
| Modal | 13 | 0.771 | 0 | 0 | 0 | 0.85 | 0.83 | 0 | 1E-05 | 0.00 | 0.00 | 0.62 | 0.65 | 0.88 |
| Modal | 14 | 0.741 | 0 | 0 | 0 | 0.85 | 0.83 | 0 | 3E-05 | 0.00 | 0.00 | 0.62 | 0.65 | 0.89 |
| Modal | 15 | 0.719 | 0 | 0 | 0 | 0.88 | 0.83 | 0 | 6E-07 | 0.05 | 0.01 | 0.62 | 0.69 | 0.90 |
| Modal | 16 | 0.712 | 0 | 0 | 0 | 0.90 | 0.83 | 0 | 7E-07 | 0.04 | 0.01 | 0.62 | 0.74 | 0.90 |
| Modal | 17 | 0.654 | 0 | 0 | 0 | 0.90 | 0.84 | 0 | 0.0068 | 0.00 | 0.00 | 0.63 | 0.74 | 0.90 |
| Modal | 18 | 0.646 | 0 | 0 | 0 | 0.90 | 0.84 | 0 | 0 | 0.00 | 0.00 | 0.63 | 0.74 | 0.90 |
| Modal | 19 | 0.646 | 0 | 0 | 0 | 0.90 | 0.84 | 0 | 0 | 0.00 | 0.00 | 0.63 | 0.74 | 0.90 |
| Modal | 20 | 0.642 | 0 | 0 | 0 | 0.90 | 0.84 | 0 | 1E-06 | 0.00 | 0.00 | 0.63 | 0.74 | 0.91 |
| Modal | 21 | 0.547 | 0 | 0.05 | 0 | 0.90 | 0.89 | 0 | 0.0851 | 0.00 | 0.00 | 0.71 | 0.74 | 0.91 |
| Modal | 22 | 0.516 | 0 | 0 | 0 | 0.90 | 0.89 | 0 | 5E-05 | 0.00 | 0.02 | 0.71 | 0.74 | 0.92 |
| Modal | 23 | 0.46 | 0 | 0 | 0 | 0.92 | 0.89 | 0 | 0 | 0.06 | 0.00 | 0.71 | 0.80 | 0.92 |
| Modal | 24 | 0.43 | 0 | 0 | 0 | 0.93 | 0.89 | 0 | 4E-06 | 0.00 | 0.00 | 0.71 | 0.80 | 0.93 |
| Modal | 25 | 0.419 | 0 | 0 | 0 | 0.93 | 0.89 | 0 | 1E-06 | 0.00 | 0.01 | 0.71 | 0.80 | 0.93 |

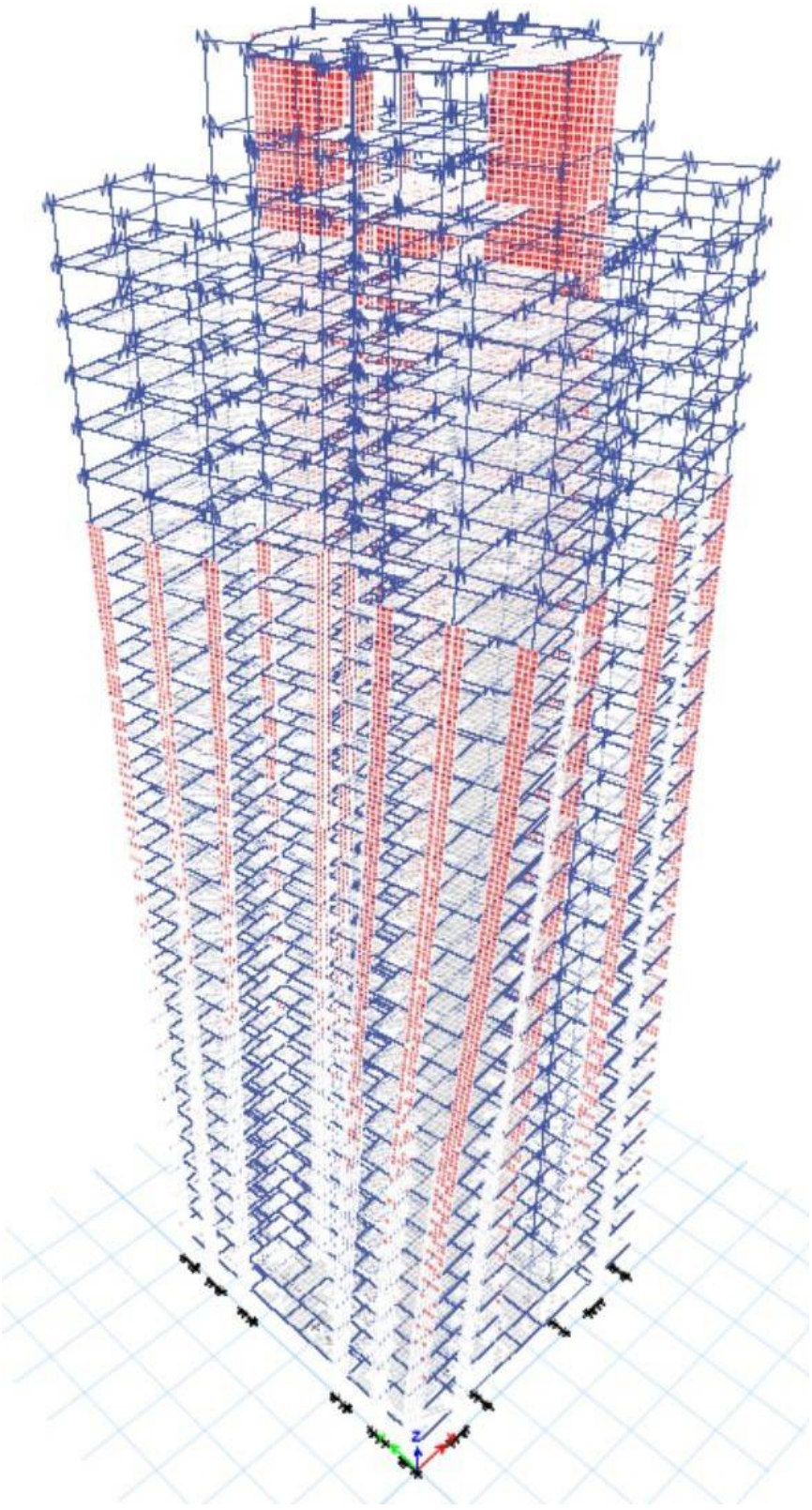


**Fig : 3 – Mode shape of 1st Mode**

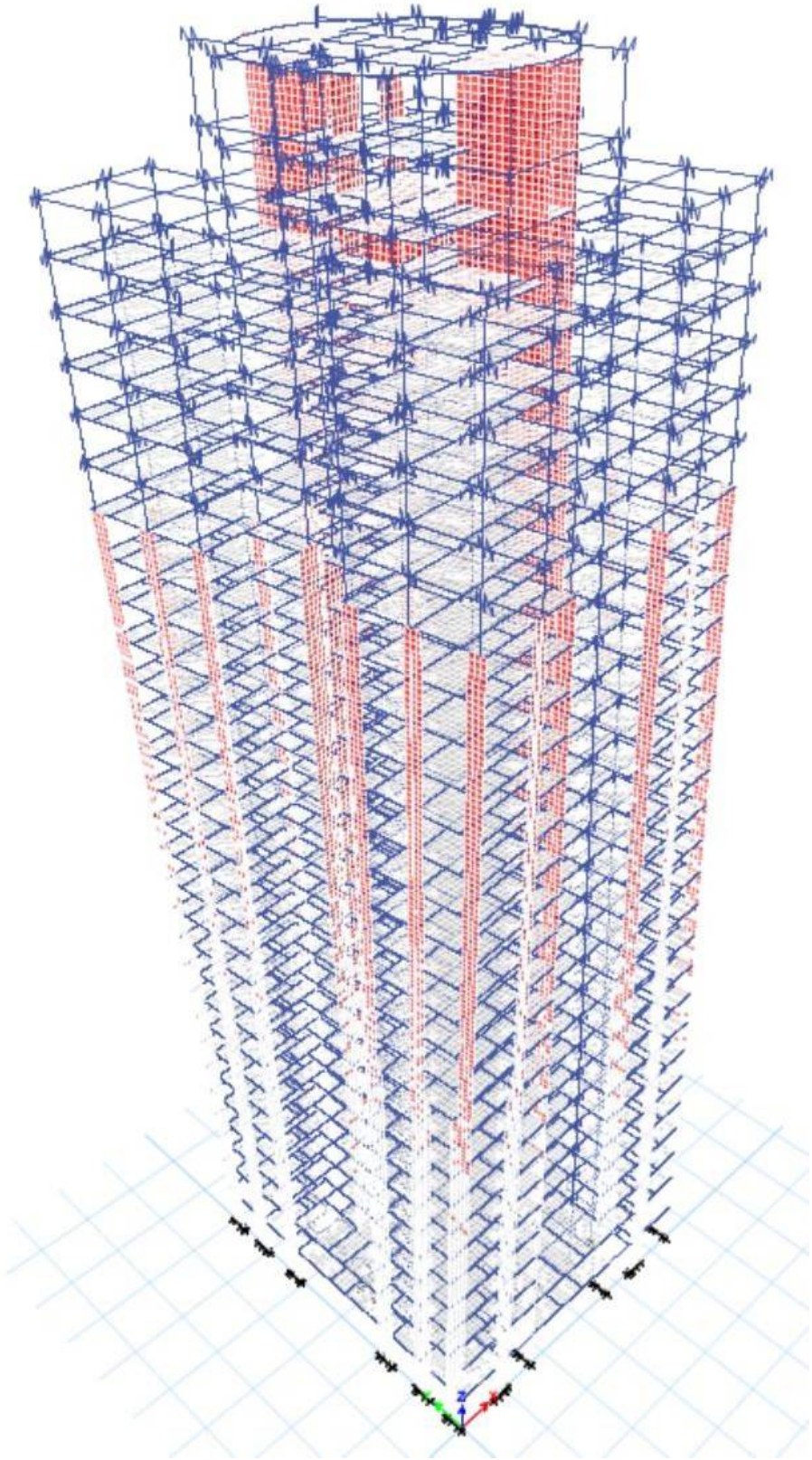


**Fig: 4 – Mode shape of 2nd Mode**

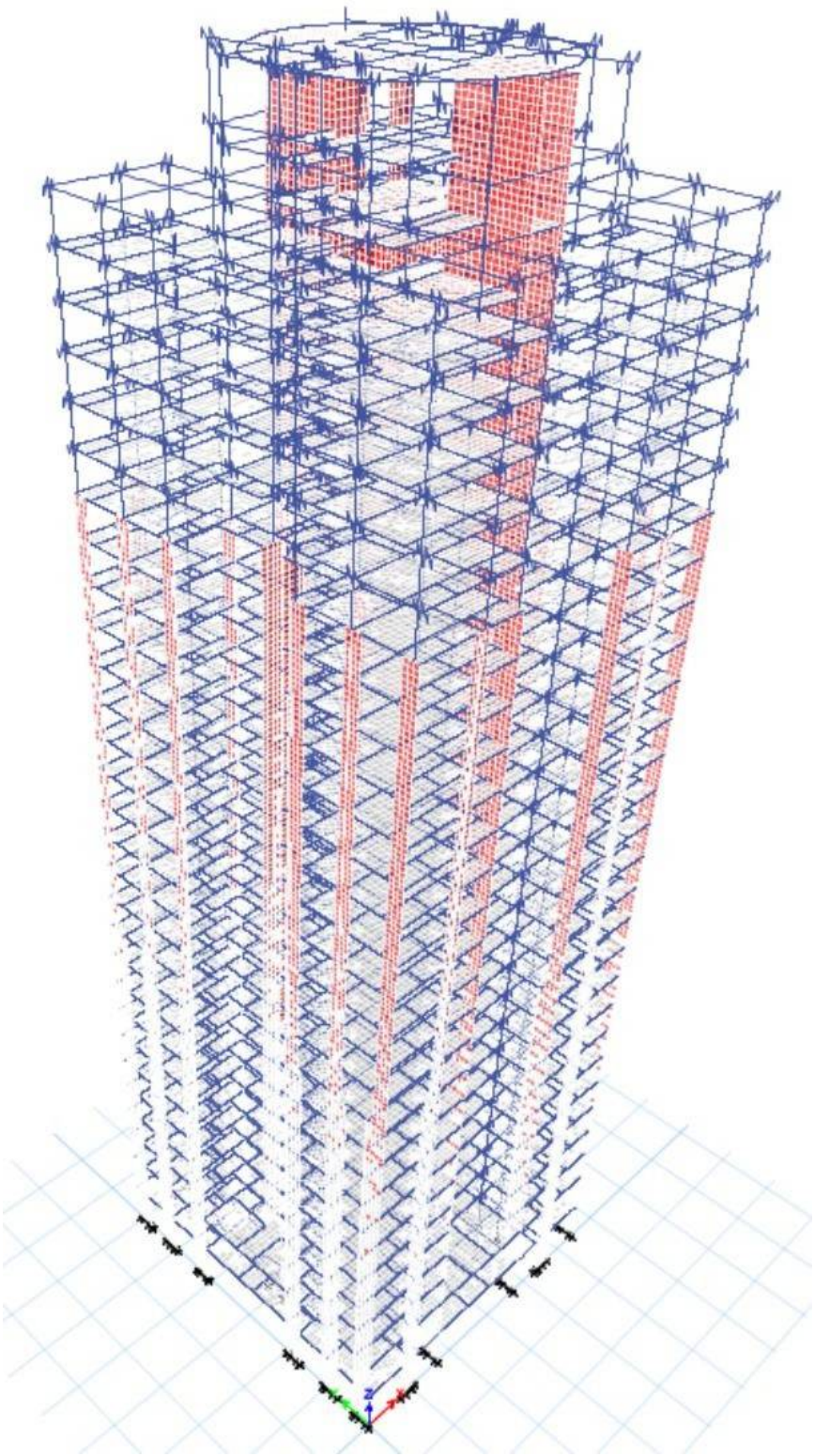


**Fig : 5 – Mode shape of 3rd Mode**

#### 6.1.6.1 Maximum Storey Displacement

IS 16700 limits the maximum displacement due to wind load to H/500, where ~~H is the~~ total height of the building. Therefore, the maximum displacement limit is = (6.92×1000)/500= 193.84mm.

The wind load only load case along X direction has a maximum displacement of 106mm & the wind load along Y direction has a maximum displacement of 69mm. Therefore, the maximum storey displacement is within the limit.

#### 6.1.6.2 Maximum Storey Drift

The governing load case for the storey drift calculation was 'EQX(-ecx)' along X – direction & 'EQY(-ecy)' along Y - direction. The maximum storey drift ratio is limited to 0.004 byboth IS 1893-2002

**Table 1.5 – Maximum Storey Drifts**

| TABLE: Story Drifts | | |
|---|---|---|
| Story | Drift | |
| | EQX | EQY |
| HELIPAD(+96.92) | 0.003074 | 0.002416 |
| MR ROOF(+92.55) | 0.002856 | 0.002274 |
| MR+OHT(+89.6) | 0.003184 | 0.003379 |
| TF(+86.4) | 0.002208 | 0.001569 |
| 26F(+83.3) | 0.002329 | 0.001618 |
| 25F(+80.15) | 0.00245 | 0.001681 |
| 24F(+77) | 0.002563 | 0.001756 |
| 23F(+73.85) | 0.002623 | 0.001864 |
| 22F(+70.7) | 0.002445 | 0.001823 |
| 21F(+67.55) | 0.002508 | 0.001867 |
| 20F(+64.4) | 0.002582 | 0.001919 |
| 19F(+61.25) | 0.002651 | 0.001968 |
| 18F(+58.1) | 0.002712 | 0.002008 |
| 17F(+54.95) | 0.002765 | 0.002039 |
| 16F(+51.8) | 0.002809 | 0.002061 |
| 15F(+48.65) | 0.002842 | 0.002074 |
| 14F(+45.5) | 0.002863 | 0.002078 |
| 13F(+42.35) | 0.00287 | 0.002075 |
| 12F(+39.2) | 0.002859 | 0.002066 |
| 11F(+36.05) | 0.002802 | 0.002043 |
| 10F(+32.9) | 0.002609 | 0.001928 |
| 9F(+29.75) | 0.002548 | 0.001862 |
| 8F(+26.6) | 0.002473 | 0.001789 |
| 7F(+23.45) | 0.002384 | 0.001706 |
| 6F(20.3) | 0.002278 | 0.001609 |
| 5F(17.15) | 0.002149 | 0.001492 |
| 4F(+14) | 0.001994 | 0.001352 |
| 3F(+10.85) | 0.001807 | 0.001186 |
| 2F(+7.7) | 0.001574 | 0.000985 |
| 1F(+4.45) | 0.001219 | 0.000698 |

| | | |
|---|---|---|
| GF(+0.25) | 0.00053 | 0.000294 |

## 6.1.7 DESIGN COMBINATIONS

### 6.1.7.1 Factored Load Combinations

6.1.7.2 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead)

6.1.7.3 1.5(Dead+Live+Brick+Sunshade+Roof Live+ Machine+FF+WT+Stair Dead+Stair Live)

6.1.7.4 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+Wind0)

6.1.7.5 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+ Stair Live-Wind0)

6.1.7.6 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+Wind90)

6.1.7.7 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live- Wind90)

6.1.7.8 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+Wind0)

6.1.7.9 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-Wind0)

6.1.7.10 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+Wind90)

6.1.7.11 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-Wind90)

6.1.7.12 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)+1.5(Wind0)

6.1.7.13 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-1.5(Wind0)

6.1.7.14 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)+1.5(Wind90)

6.1.7.15 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-1.5(Wind90)

6.1.7.16 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQX)

6.1.7.17 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQX)1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQY)

6.1.7.18 1.2(Dead+LiveBrick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQY)

6.1.7.19 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQX(+ecx))

6.1.7.20 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQX(+ecx))

6.1.7.21 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQX(+ecx))

6.1.7.22 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQX(-ecx))

6.1.7.23 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQY(+ecy))

6.1.7.24 1.2(Dead+Live+Brick+Sunshade+Roof live+Machine+FF+WT+Stair Dead+Stair Live-EQY(+ecy))

6.1.7.25 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQY(+ecy))

6.1.7.26 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+ Stair Live-EQY(-ecy))

6.1.7.27 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQX)

6.1.7.28 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-EQX)

6.1.7.29 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY)

6.1.7.30 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-EQY)

6.1.7.31 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQX(+ecx))

6.1.7.32 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-EQX(+ecx))

6.1.7.33 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQX(-ecx))

6.1.7.34 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-EQX(-ecx))

6.1.7.35 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY(+ecy))

6.1.7.36 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead-EQY(+ecy))

6.1.7.37 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY(-ecy))

6.1.7.38 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY(-ecy))

6.1.7.39 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +1.5(EQX)

6.1.7.40 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-1.5(EQX)

6.1.7.41 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +1.5(EQY)

6.1.7.42 0.9(Dead+Brick+Sunshade+FF+WT+StairDead)-1.5(EQY)

6.1.7.43 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +1.5(EQX(+ecx))

6.1.7.44 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-1.5(EQX(+ecx))

6.1.7.45 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +1.5(EQX(-ecx))

6.1.7.46 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-1.5(EQX(-ecx))

6.1.7.47 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +1.5(EQY(+ecy))

6.1.7.48 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-1.5(EQX(+ecy))

6.1.7.49 0.9(Dead+Brick+Sunshade+FF+WT+StairDead) +1.5(EQX(-ecy))

6.1.7.50 0.9(Dead+Brick+Sunshade+FF+WT+Stari Dead)-1.5(EQX(-ecy))

6.1.7.51 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+RSPEC)

6.1.7.52 1.2(Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+ RESPEC(TOR))

6.1.7.53 1.5(Dead+Brick+Sunshade+FF+WT+Stair Dead+RSPEC)

6.1.7.54 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)+1.5(RSPEC)

### 6.1.8 Un – Factored Load Combinations

6.1.8.1 Dead+Brick+Sunshade+FF+WT+Stair Dead

6.1.8.2 Dead+Live+Brick+Sunshade+Roof Live+ Machine+FF+WT+Stair Dead+Stair Live

6.1.8.3 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+Wind0

6.1.8.4 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+ Stair Live-Wind0

6.1.8.5 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+Wind90

6.1.8.6 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-Wind90

6.1.8.7 Dead+Brick+Sunshade+FF+WT+Stair Dead+Wind0

6.1.8.8 Dead+Brick+Sunshade+FF+WT+Stair Dead-Wind0

6.1.8.9 Dead+Brick+Sunshade+FF+WT+Stair Dead+Wind90

6.1.8.10 Dead+Brick+Sunshade+FF+WT+Stair Dead-Wind90

6.1.8.11 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)+Wind0

6.1.8.12 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-Wind0

6.1.8.13 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)+Wind90

6.1.8.14 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-Wind90

6.1.8.15 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQX

6.1.8.16 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQX

6.1.8.17 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+EQY

6.1.8.18 Dead+LiveBrick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQY

6.1.8.19 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+EQX(+ecx)

6.1.8.20 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQX(+ecx)

6.1.8.21 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+EQX(+ecx)

6.1.8.22 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live-EQX(-ecx)

6.1.8.23 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+EQY(+ecy)

6.1.8.24 Dead+Live+Brick+Sunshade+Roof live+Machine+FF+WT+Stair Dead+Stair Live-EQY(+ecy)

6.1.8.25 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+EQY(+ecy)

6.1.8.26 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+ Stair Live-EQY(-ecy)

6.1.8.27 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQX

6.1.8.28 Dead+Brick+Sunshade+FF+WT+Stair Dead-EQX

6.1.8.29 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY

6.1.8.30 Dead+Brick+Sunshade+FF+WT+Stair Dead-EQY

6.1.8.31 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQX(+ecx)

6.1.8.32 Dead+Brick+Sunshade+FF+WT+Stair Dead-EQX(+ecx)

6.1.8.33 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQX(-ecx)

6.1.8.34 Dead+Brick+Sunshade+FF+WT+Stair Dead-EQX(-ecx)

6.1.8.35 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY(+ecy)

6.1.8.36 Dead+Brick+Sunshade+FF+WT+Stair Dead-EQY(+ecy)

6.1.8.37 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY(-ecy)

6.1.8.38 Dead+Brick+Sunshade+FF+WT+Stair Dead+EQY(-ecy)

6.1.8.39 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +EQX

6.1.8.40 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-EQX

6.1.8.41 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)+EQY

6.1.8.42 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-EQY

6.1.8.43 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +EQX(+ecx)

6.1.8.44 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-EQX(+ecx)

6.1.8.45 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +EQX(-ecx)

6.1.8.46 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-EQX(-ecx)

6.1.8.47 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead) +EQX(+ecy)

6.1.8.48 0.9(Dead+Brick+Sunshade+FF+WT+Stair Dead)-EQX(+ecy)

6.1.8.49 0.9(Dead+Brick+Sunshade+FF+WT+StairDead) +EQX(-ecy)

6.1.8.50 0.9(Dead+Brick+Sunshade+FF+WT+Stari Dead)-EQX(-ecy)

6.1.8.51 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+StairLive+RSPEC

6.1.8.52 Dead+Live+Brick+Sunshade+RoofLive+Machine+FF+WT+Stair Dead+Stair Live+RESPEC(TOR)

6.1.8.53 Dead+Brick+Sunshade+FF+WT+Stair Dead+RSPEC

## 6.2 ABOUT THE DESIGN ANALYSIS

In order to calculate the force demands of the existing structure, a mathematical model of the existing structure was made using the structural analysis software ETABS V19 and ETABS Model of Tower C without distress condition i.e., 100% health condition of the building. The reinforcement details read from GFC drawings and applied in the ETABS Model. In the preparation of mathematical model- ETABS Model all the parameters used as given in Design Basis Report, the details of floor loading, wind parameters and seismic parameters, grade of concrete and grade of steel were presented. The sizes of the structural members, the reinforcement available in the columns and shear walls and other details given in the GFC drawings were used. The strength of concrete in the structural elements as given in GFC & DBR is used in evaluating performance of structure with 100% health condition (without Distress) and with reduced health condition (with Distress) of the building.

The analysis results obtained from the mathematical model used for the design of vertical structural members and Horizontal members i.e., columns, shear walls Beams and Slabs. The mathematical model – ETABS Model results after analysis and design, which forms the demand data, compared with both the original intended capacities of the structural members without any distress and calculated probable capacity of structural members currently present in the existing structure after distress with available strength of concrete and extent of corrosion of rebars due to chloride attack from external and inherent chloride content in the members. Proposed a retrofitting strategy/ methodology to strengthen the existing distressed structure columns, shear walls, beams and slabs, staircase and retaining wall to satisfy the actual force demands due to gravity loads and lateral loads and their combinations as IS Code provision.

The parameters considered for capacity calculations of columns and shear wall are Axial capacity, flexural capacity and shear capacity. The ratio of demand and capacity (D/C) of column and shear wall is calculated for axial load, flexure and shear. The D/C ratio greater than 1 is considered as over stressed, exceeding the capacity of the member and inadequate, while D/C ratio less than 1 is considered adequate.

### 6.2.1 DETAILS RECEIVED FROM AWHO

1. MOU dated 27-12-2022.
2. GFC Drawings
3. Soil Report
4. Architectural Drawings

### 6.2.2 DETAILS NOT RECEIVED FROM AWHO

Retaining wall details

### 6.2.3 DEMAND AND CAPACITY EVALUATION METHOD

#### 6.2.3.1 FOR COLUMNS AND SHEAR WALLS

For the capacity calculation of walls, the shear walls on the ETABS program are assigned as piers. The section properties of the wall were modelled by using the "define general pier sections" option provided on ETABS shear wall design. The design check for columns were done using the "Change design section" option provided in the concrete frame design. The column section properties were modeled during frame element definition. Fig :1 indicate tower C columns and shear wall location

#### 6.2.3.2 Axial & Flexural capacity Calculation:

The design calculation is done using the software ETABS V19. It involves plotting the 3 – dimensional interaction surface with axial load and bi – axial moments representing capacity as shown on Fig 2. The demand axial load and bi – axial moments are marked on the 3D space. This point is marked as L on the 2D plane on Fig 3. A line between origin 'O' and 'L' is extra plotted till the failure curve. The point on the failure cure is the capacity, marked as 'C' on Fig 3. The D/C ratio is the ratio of OC/OL

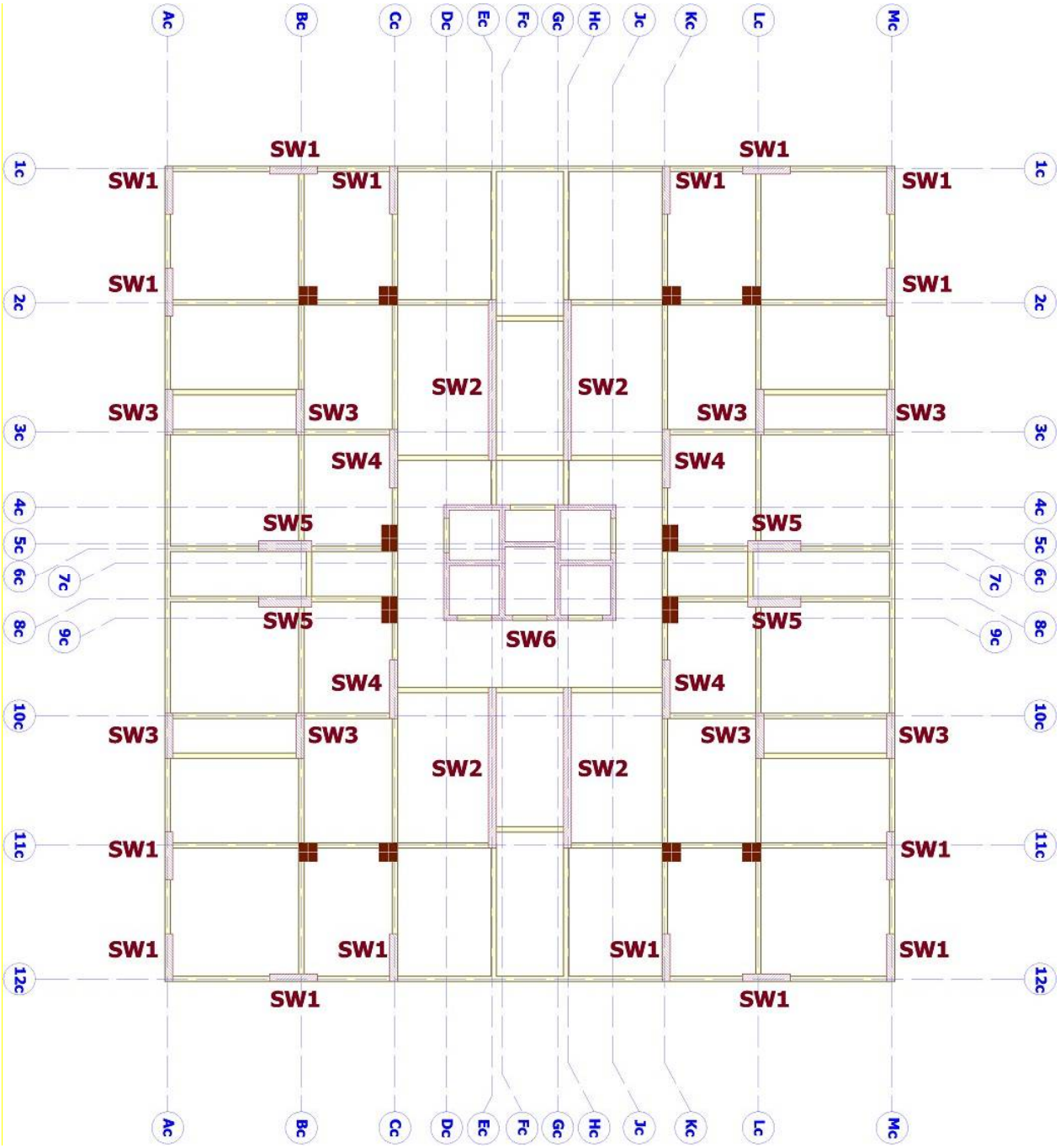



**Fig : 1. Tower C- Column & Shear wall layout**

The Capacity of Columns and Shear walls evaluation procedure is as follows

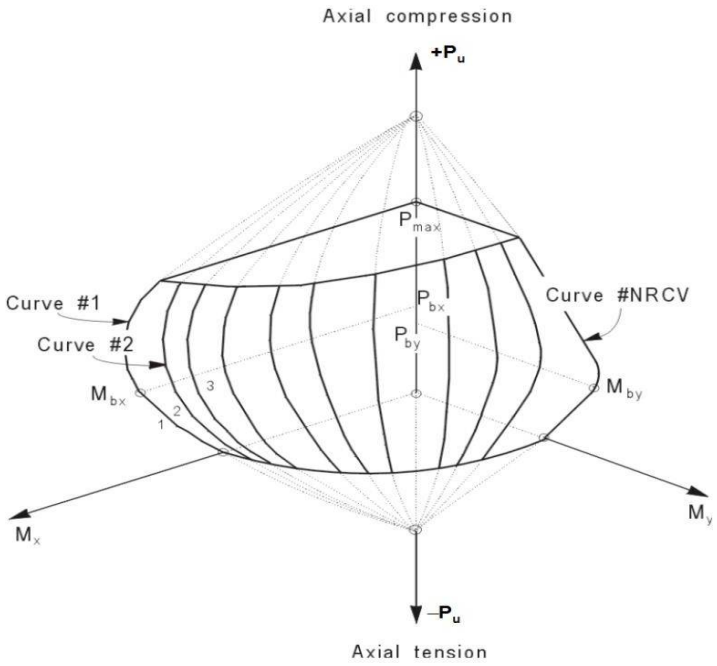



**Fig : 2 – 3D interaction surface**

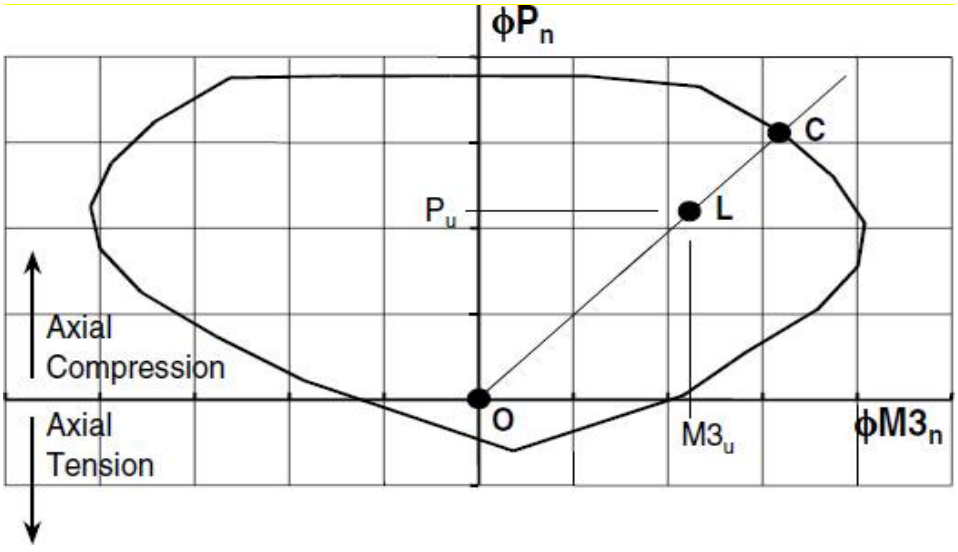



**Fig : 3 – Demand and capacity points on 2D interaction curve**

#### 6.2.3.3 Shear capacity calculation

The shear capacity of concrete for shear walls is calculated as per IS 456. The nominal shear stress is taken as, $\tau_v$ =Vu/ d*t as per IS 13920-1993 where 't' is the thickness and 'd' is the effective width taken as 0.8 times depth of the section considered.

For columns, the shear capacity is calculated following normal IS 456 procedures. The concrete shear capacity of concrete, $V_c$ is calculated from Table 14 of IS 456 for half the percentage of main bars in the design section considered. For both shear walls and columns, the maximum allowable shear is limited to the values provided on Table 9 of IS 456 -2000.

The D/C value is the ratio of demand shear force, shear capacities of concrete, and shear reinforcements combined. A value of D/C ratio less than 1 indicates adequate, while a value greater than 1 indicates over stressed.

#### 6.2.3.4 Classification of distress

The columns and shear walls form the primary components of the structure for lateral resistance. Hence, they are not permitted to undergo more damage or deformations. Therefore, special care should be provided for critical members during retrofitting as well as in ensuring the capacity after retrofitting. For identifying the critical members based on capacity, GEC made 4 numbers of classifications, 2 each for gravity loading and lateral loading respectively. They are **Class α**, **Class β**, **Class γ**& **Class δ**.

The first two classifications, Class α & Class β are considered for only vertical load combinations and the remaining two classifications, Class γ & Class δ are considered for lateral loadcombinations (Wind and Seismic loading). Therefore, a Column section or Shear wall section can have 4 classifications based on the type of load combinations. The details for each classification are

a. *Class α – Adequate capacity for carrying vertical loads/vertical load combinations*
b. *Class β – In adequate capacity for carrying vertical loads/vertical load combinations*
c. *Class γ – Adequate capacity for carrying lateral loads/lateral load combinations*
d. *Class δ – In adequate capacity for carrying lateral loads/lateral load combinations*

#### 6.2.3.5 Precautions before Retrofitting

The columns and shear walls, which belongs to **Class β** are considered very critical, since they have inadequate capacity to carry the vertical loads generated due to the ***dead loads and live loads*** present in the structure. Retrofitting of Class β members shall be done by providing adequate props, which

supports the beams that connect the Class β members, such that the vertical stress on the Class β members can be reduced and redistributed during the retrofitting process. The columns and shear walls, which belong to **Class δ** are critical during the occurrence of lateral loads. Since the probability of occurrence of seismic events is very low, the risk involved in retrofitting of **Class δ** members is much lower than compared to the same for Class β members. However, retrofitting of Class **δ** members shall be done by providing adequate props, which supports the beams that connect the Class **δ** members, such that the vertical stress on the Class **δ** members can be reduced and redistributed during the retrofitting process.

The retrofitting of columns belonging to both **Class α** and **Class γ** can be done without much risk, as they possess enough capacity to carry the vertical as well as lateral loads. However, retrofitting of Class α and Class γ members shall be done by providing adequate props, which supports the beams that connect the Class α and Class γ members, such that the vertical stress on the Class α and Class γ members can be reduced and redistributed during the retrofitting process.

### 6.2.4 REINFORCEMENT CONSIDERATION IN DISTRESS EVALUATION

The building vertical element columns and shear walls having corrosion of reinforcement, the extent of rebar corrosion **assumed** as 5% to 10% for the main reinforcement of the vertical elements and for 50% for the shear links/stirrups. The capacity and demand of the vertical elements, columns and shear walls are evaluated as per the reinforcement provided in the GFC drawings and with reduction in area of reinforcement. The actual strength of concrete in columns and shear walls considered as M25.

### 6.2.5 ANALYSIS AND DISTRESS EVALUATION

The analysis and design of tower C is carried out using the ETABS Model, the ratio Demand / Capacity is evaluated, the ratio Demand / Capacity less than 1, indicates column or shear wall is having adequate capacity to carry the load and there is no distress of the elements. ***The ratio Demand / Capacity greater than 1 indicate column or shear wall is having inadequate capacity to carry the load and there will be distress of the elements, which require strengthening.***

#### 6.2.5.1 Without Distress the followings cases are considered

Case1. Without Distress - Column Design -Gravity Load Case

Case2. Without Distress – Shear Wall Design -Gravity Load Case

Case3. Without Distress - Column Design –Lateral Load Case

Case4. Without Distress – Shear Wall Design - Lateral Load Case

**6.2.5.2 With Distress** the followings cases are considered

Case1. With Distress - Column Design -Gravity Load Case

Case2. With Distress – Shear Wall Design -Gravity Load Case

Case3. With Distress - Column Design –Lateral Load Case

Case4. With Distress – Shear Wall Design - Lateral Load Case

The design details of columns and Shear Walls for all the above-mentioned cases Without Distress & with Distress are presented in Annexure 1 to 8.

ETABS Result Sheets given in Annexure 1 to 8 to be read in conjunction with Table A1 to check the values of Columns & Shear walls capacities and demand for Gravity Loading and Lateral Loading of with Distress and Without Distress output results of ETABS model.

**Table A1 – Column & Shear wall ID Drawing/ETABS Model**

| Drawing ID | ETABS Section ID (All Floors) |
|---|---|
| C1 | P1, P6, P31, P36. |
| C2 | P2, P5, P32, P35. |
| C3 | P3, P4, P33, P34. |
| C4 | P7, P10, P29, P30. |
| C5 | C1, C3, C5, C7. |
| C6 | C2, C4, C6, C8. |
| C7 | P11, P14, P23, P28. |
| C8 | P12, P13, P24, P27. |
| C9 | P15, P16, P21, P22. |
| C10 | P17, P18, P19, P20. |
| C11 | C9, C10, C11, C12. |
| CW1 | P8, P9, P25, P26. |
| CW2 | P37 |

A Sample ETABS Results for column & Shear Wall is given below for checking the results

## ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

Refer for Floor Level

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C1 | 32 | C5 (0-1F) | 4020 | 1 |

Refer for ETABS Section ID. Read in Conjunction with Table no.A1 for corresponding Drawing ID.

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | LtWt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.846 |
| Bottom | 19636 | 4.01 | 0.85 |

Refer this values for Demand vs. Capacity Ratio.

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9201.2391 | 288.6735 | 0.5225 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 9245.5465 | -290.0636 | -3.5677 | 0 | 201] 1.5 [DL + LL] |

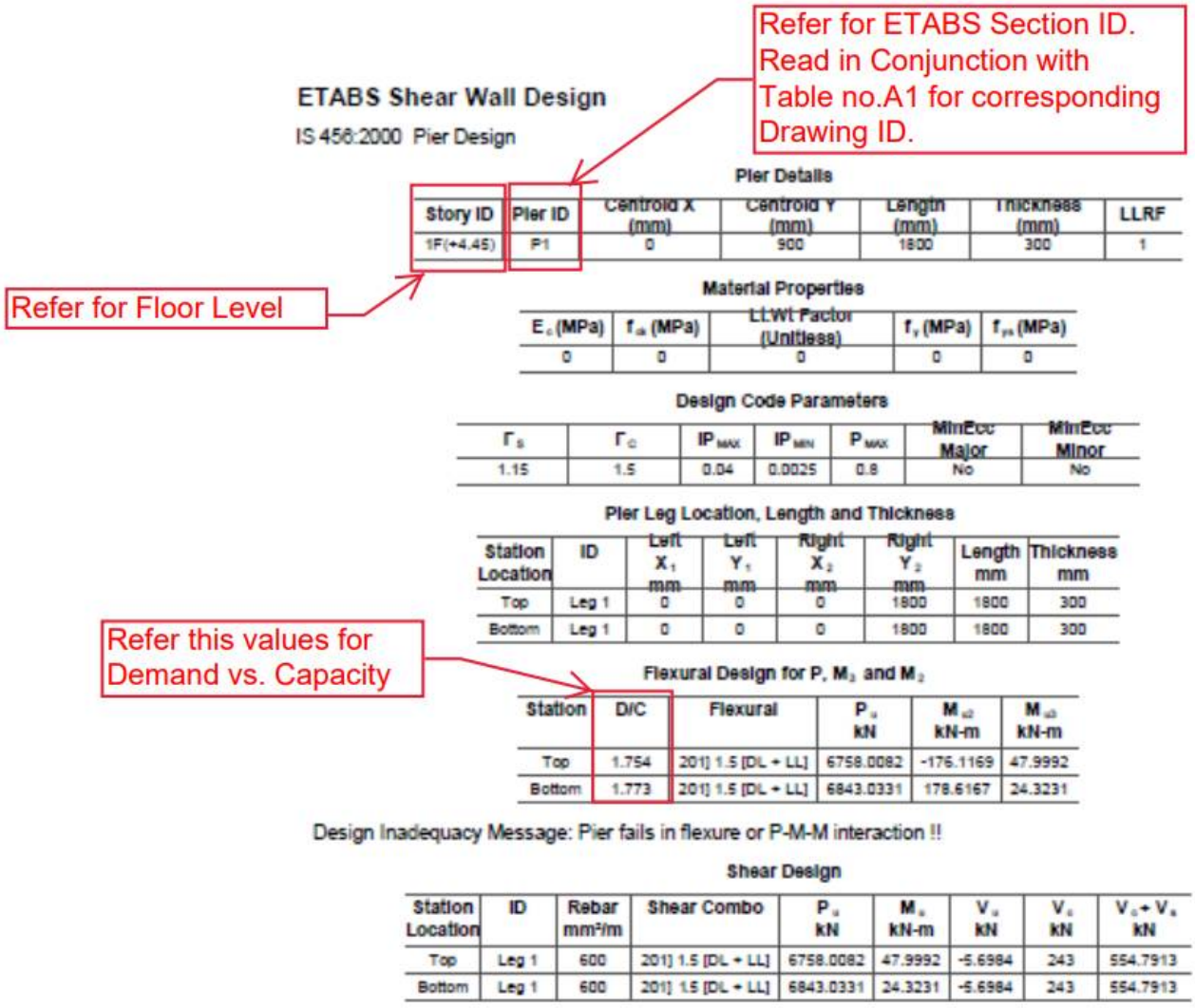
**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6527 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6527 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.383 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.383 | 1608 | 201] 1.5 [DL + LL] |

**Column Results - ETABS output Format.**




**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_s$ | $\Gamma_c$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.754 | 201] 1.5 [DL + LL] | 6758.0082 | -176.1169 | 47.9992 |
| Bottom | 1.773 | 201] 1.5 [DL + LL] | 6843.0331 | 178.6167 | 24.3231 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_s$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6758.0082 | 47.9992 | -5.6984 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6843.0331 | 24.3231 | -5.6984 | 243 | 554.7913 |

**Shear wall Results-ETABS output Format.**

## Demand/ Capacity Ratio for Columns & Shear Wall

Demand / Capacity Ratio - Refer Annexure 1 to 8, for with and without distress cases

**Without Distress** the followings cases are considered

Case1. Without Distress - Column Design -Gravity Load Case

Case2. Without Distress – Shear Wall Design -Gravity Load Case

Case3. Without Distress - Column Design –Lateral Load Case

Case4. Without Distress – Shear Wall Design - Lateral Load Case

**With Distress** the followings cases are considered

Case1. With Distress - Column Design -Gravity Load Case

Case2. With Distress – Shear Wall Design -Gravity Load Case

Case3. With Distress - Column Design –Lateral Load Case
Case4. With Distress – Shear Wall Design - Lateral Load Case
Summary of D/C ratio with distress Gravity Load Case - Refer Annexure 9
Summary of D/C ratio -with distress Lateral Load Case- Refer Annexure 10

Table.1 Depicts Columns & Shear Wall to be strengthened based on distress condition

| Grid | Column | BF | GF | 1F | 2F | 3F | 4F | 5F | 6F | 7F | 8F | 9F | 10F | 11F | 12F | 13F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mc/1c | C1 | NR | NR | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/2c | C4 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/3c | C7 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/10c | C7 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/11c | C4 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/12c | C1 | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/1c | C2 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/2c | C5 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/3c | C8 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/6c | C10 | R | R | R | R | NR | NR | R | NR | R | R | NR | NR | NR | NR | R |
| Lc/8c | C10 | R | R | R | NR | NR | NR | R | R | R | NR | NR | NR | NR | NR | NR |
| Lc/10c | C8 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/11c | C5 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/12c | C2 | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/1c | C3 | R | R | NR | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/2c | C6 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/3c | C9 | R | R | NR | NR | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/6c | C11 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/8c | C11 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/10c | C9 | R | R | NR | NR | NR | NR | NR | NR | R | NR | NR | NR | NR | NR | NR |
| Kc/11c | C6 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/12c | C3 | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Hc/2c-3c | CW1 | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Hc/10c-11c | CW1 | NR | R | R | NR | R | R | R | R | R | NR | NR | NR | NR | R | NR |
| Ec/2c-3c | CW1 | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ec/10c-11c | CW1 | R | R | R | NR | NR | R | R | R | NR | NR | NR | NR | NR | NR | NR |
| Cc/1c | C3 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/2c | C6 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/3c | C9 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | R | NR | NR | NR | NR |
| Cc/6c | C11 | R | NR | NR | NR | NR | R | R | R | NR | R | R | NR | R | NR | NR |
| Cc/8c | C11 | R | R | NR | NR | NR | R | NR | NR | NR | R | NR | NR | NR | R | NR |
| Cc/10c | C9 | R | NR | NR | NR | NR | NR | NR | NR | R | NR | NR | NR | NR | NR | NR |
| Cc/11c | C6 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |

| Table.1 Depicts Columns & Shear Wall to be strengthened based on distress condition | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Grid** | **Column** | **BF** | **GF** | **1F** | **2F** | **3F** | **4F** | **5F** | **6F** | **7F** | **8F** | **9F** | **10F** | **11F** | **12F** | **13F** |
| Cc/12c | C3 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/1c | C2 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/2c | C5 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/3c | C8 | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/6c | C10 | R | R | R | R | NR | NR | NR | NR | NR | NR | R | NR | NR | NR | NR |
| Bc/8c | C10 | R | R | R | R | NR | R | NR | NR | NR | NR | R | R | NR | R | NR |
| Bc/10c | C8 | R | R | R | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/11c | C5 | R | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/12c | C2 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/1c | C1 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/2c | C4 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/3c | C7 | R | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/10c | C7 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/11c | C4 | R | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/12c | C1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/1c | C1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/2c | C4 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/3c | C7 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/10c | C7 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/11c | C4 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Mc/12c | C1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/1c | C2 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/2c | C5 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/3c | C8 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/6c | C10 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/8c | C10 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/10c | C8 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/11c | C5 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Lc/12c | C2 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/1c | C3 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/2c | C6 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/3c | C9 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/6c | C11 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/8c | C11 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/10c | C9 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/11c | C6 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Kc/12c | C3 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| c/2c-3c | CW1 | NR | NR | NR | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Hc/10c-11c | CW1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |

| Table.1 Depicts Columns & Shear Wall to be strengthened based on distress condition | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Grid** | **Column** | **BF** | **GF** | **1F** | **2F** | **3F** | **4F** | **5F** | **6F** | **7F** | **8F** | **9F** | **10F** | **11F** | **12F** | **13F** |
| Ec/2c-3c | CW1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ec/10c-11c | CW1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/1c | C3 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/2c | C6 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/3c | C9 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/6c | C11 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/8c | C11 | R | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/10c | C9 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/11c | C6 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Cc/12c | C3 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/1c | C2 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/2c | C5 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/3c | C8 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/6c | C10 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/8c | C10 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/10c | C8 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/11c | C5 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Bc/12c | C2 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/1c | C1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/2c | C4 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/3c | C7 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/10c | C7 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/11c | C4 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Ac/12c | C1 | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |

NR - Not Required, R – Required

### 6.2.6 BEAMS EVALUATION

There are 135 beam in Ground floor level, 152 beams in First Floor Level and 140 beams in the Typical Floors. As per the analysis and design without any distress, the required reinforcement for beam are marginally high compare to the provided reinforcement (Refer Annexure 11 to 14). Few beams are requiring strengthening due to degradation due to corrosion of rebars at various floors, refer annexure 11 to 15.

Annexure 11- Ground Floor Beam Details

Annexure 12- 1st Floor Beam Details

Annexure 13- 2nd & 3rd Floor Beam Details

Annexure 14- 4th to 10th Floor Beam Details

Annexure 15- 11th to 22nd Floor Beam Details

Beams with distress shall be strengthened by concrete encasement providing additional T20/T16 based on degradation level based on site condition.

| Schedule of beams to be strengthened due to distress | |
|---|---|
| **Floor** | **Beams schedule** |
| BF | FB1, FB2, FB3, FB4, FB5, FB23, FB30, FB54, FB67, FB68, FB69, FB70, FB71, FB107, FB131, FB132, FB133, FB134, FB135 |
| GF | FB3, FB30, FB64, FB69, FB133 |
| 1F | FB11, FB16, FB122 |
| 2F | FB56, FB118, FB122 |
| 3F | FB56, FB122, FB126 |
| 4F | FB11, FB12, FB56, FB122, FB126, |
| 5F | FB30, FB31, FB35, FB56, FB66, FB86, FB125 |
| 6F | FB35, FB56 |
| 7F | FB30, FB31, FB34, FB35, FB56, |
| 8F | FB31, FB56, FB122 |
| 9F | FB86, FB122 |
| 10F | - |
| 11F | - |
| 12F | - |
| 13F | FB56, FB65 |
| 14F | FB1, FB2, FB5, FB86 |

### 6.2.7 SLABS EVALUATION

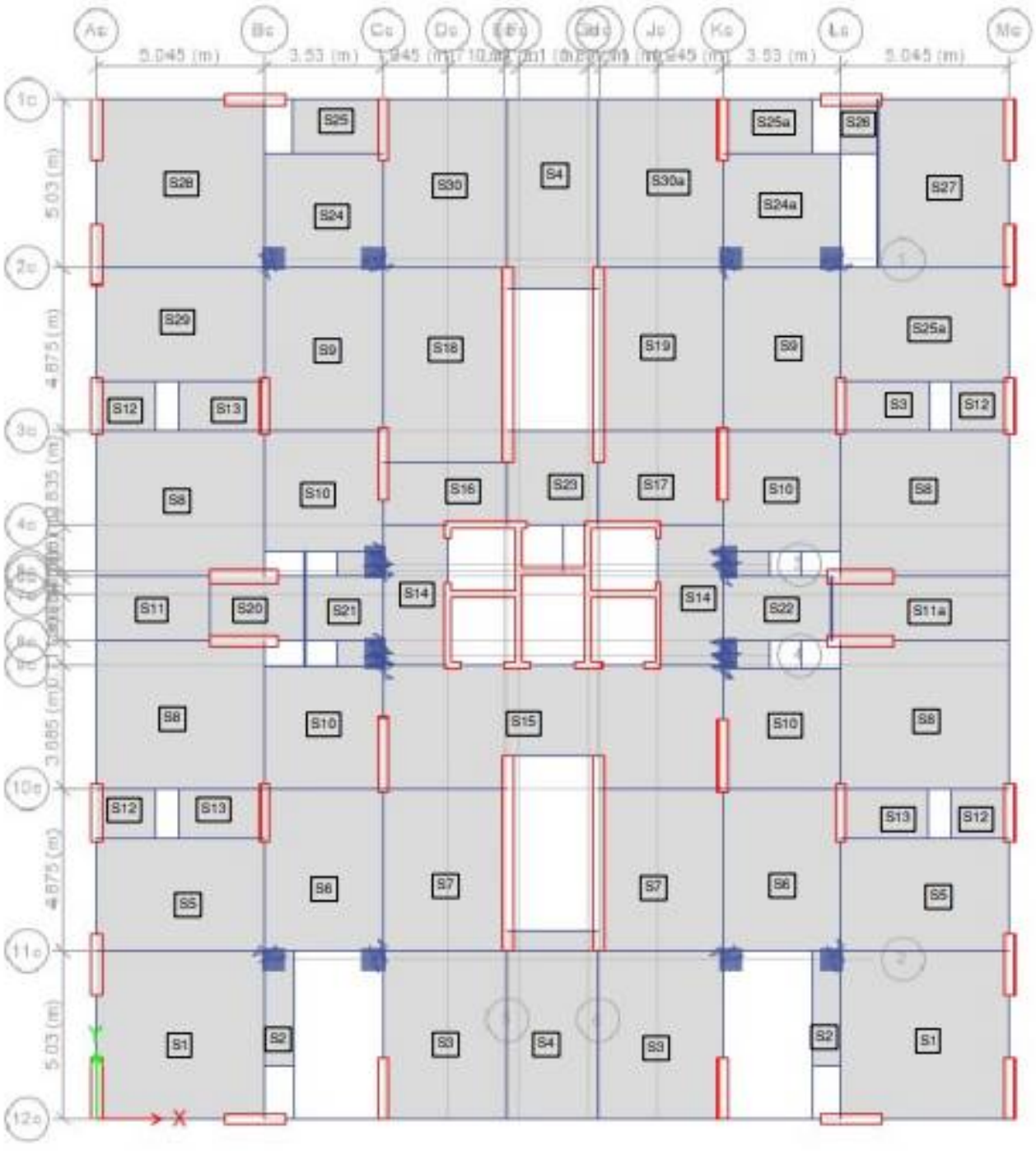
There are 35 Slab panels in the Ground Floor, 24 slab panels in the First Floor and also 24 slab panels Second and Typical floors. From analysis and design, the provided reinforcement is more than the require reinforcement for flexure and shear, however few slab panel are not satisfying the deflection criterion and given in Annexure 16. Due to aggressive environment and other degradation parameters, the slabs are under distress with corrosion of rebar, spalling of concrete is observed in the ground floor slab and require strengthening. Deflection contour for the floor plates ate provided in Annexures 17 to 19.

Annexure 16- GF, FF & Typical Floor reinforcement Demand

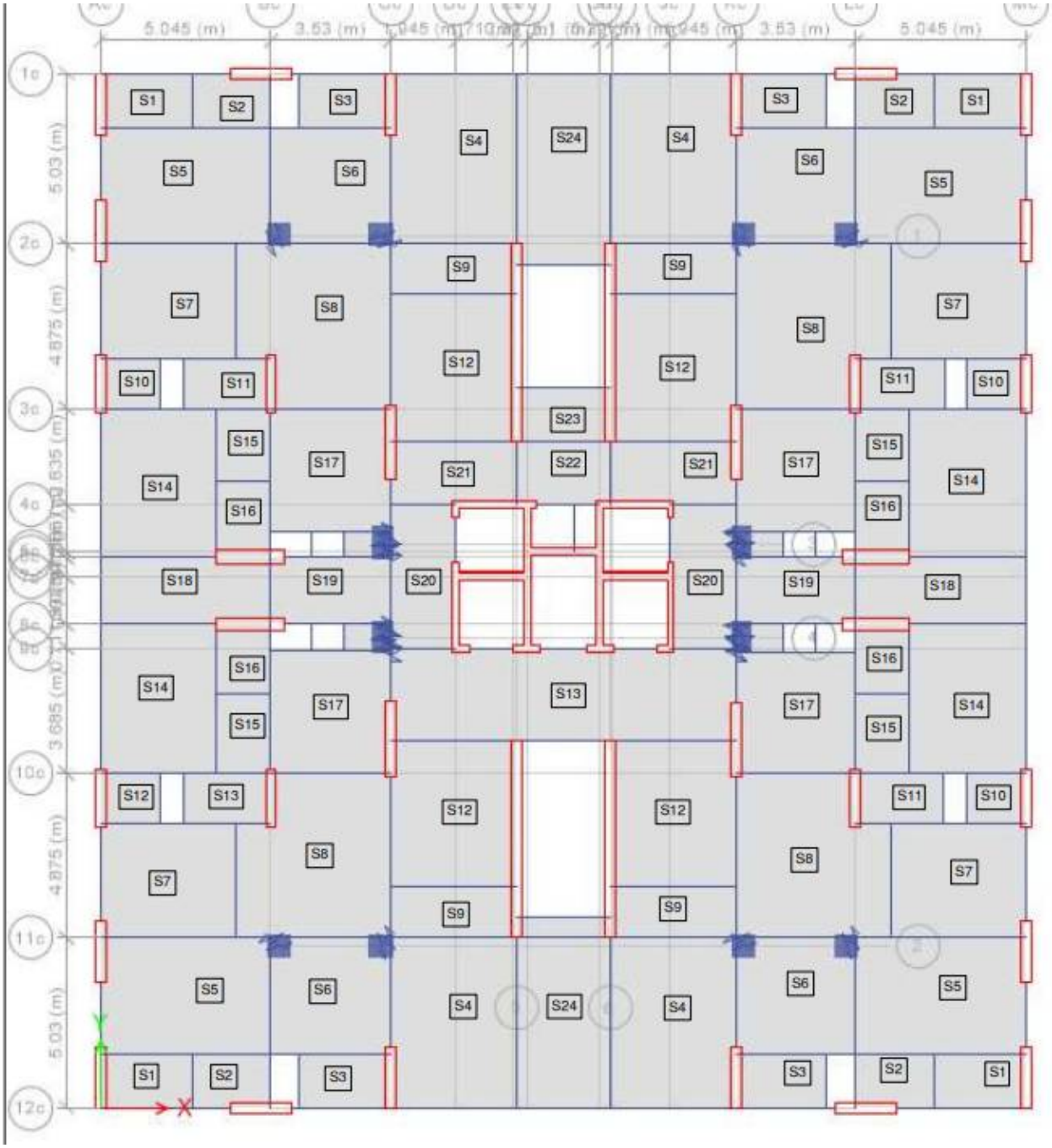
Annexure 17- Ground Floor Deflection Contour

Annexure 18- First Floor Deflection Contour

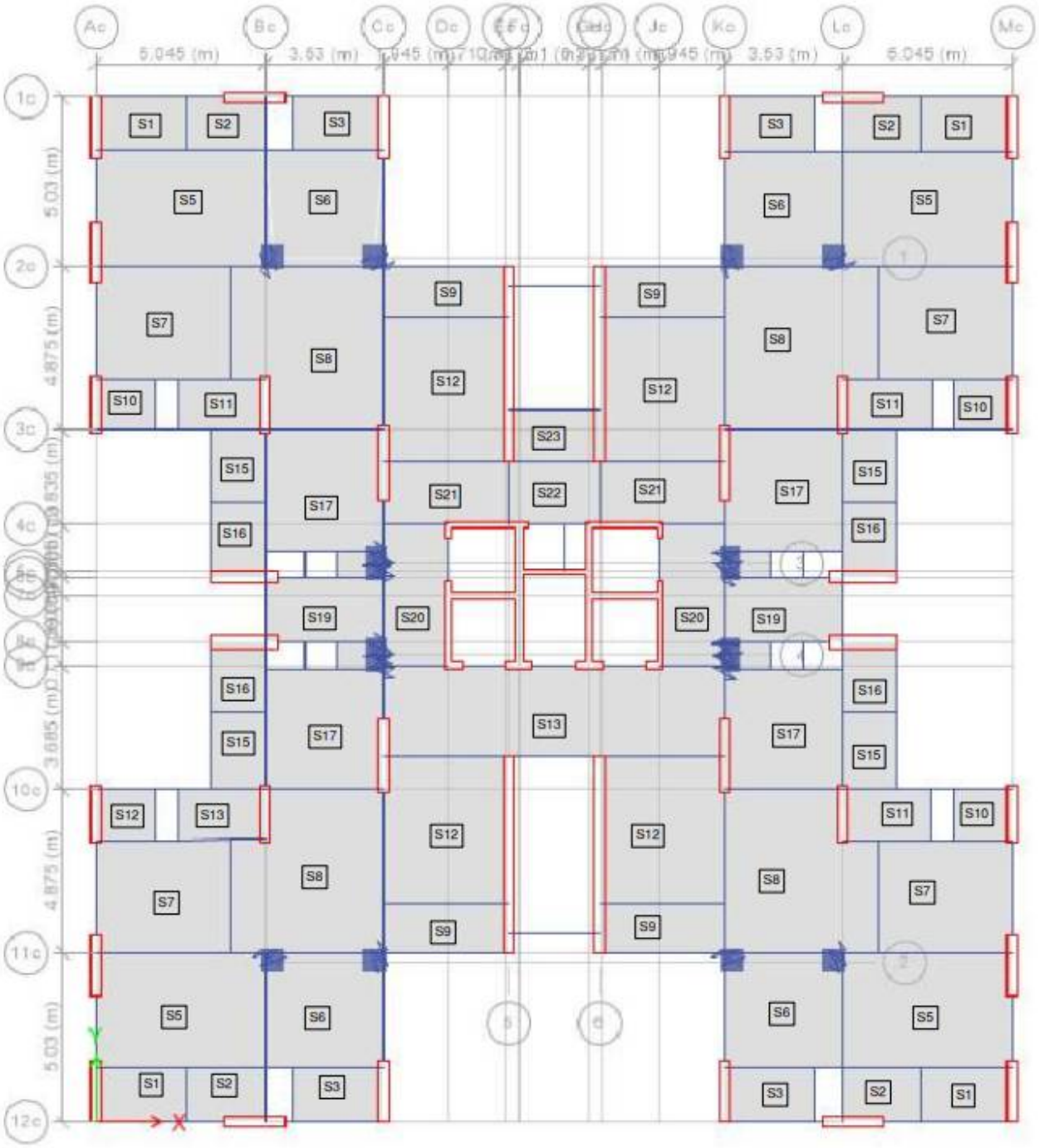
Annexure 19- Second Floor Deflection Contour




Ground Floor - Slab Layout




First Floor - Slab Layout




Typical Floor Slab Layout

### 6.2.8 FOUNDATION EVALUATION

The substructure for Tower C is pile foundation with pile cap, the diameter of the pile s used are P1=800mm ϕ, P2= 1000mm ϕ, P3=1100mm ϕ and P4= 600mm ϕ and depth of pile varies from 45m to 55 m, for the group of pile are provided based on the column loads due to Gravity and lateral load cases. Pile Cap PCA, PCB, PCC, PCD, PCE, PCF and PCQ.

Utility ratio of group of piles i.e., Demand /Capacity for gravity loads and seismic loads are given for the Tower C are provided in Annexure 22.

Table: A2, Depicts Demad Vs Capcity of Piles

| **Tower C** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Demand / Capacity of Total Piles** | | | | | | | |
| Total Weight of the Building-( DL + LL) | | | | | = | 161788 kN | |
| Total Weight of the Building-(DL+LL+EQ) | | | | | = | 278574 kN | |
| **Pile Name** | **Dia** | | **Capacity of 1 Pile** | **Nos.** | **Total Capacity** | | |
| P1 | 800 | mm | 1800 | 24 | 43200 kN | | |
| P2 | 1000 | mm | 2800 | 48 | 134400 kN | | |
| P3 | 1100 | mm | 3500 | 60 | 210000 kN | | |
| P4 | 600 | mm | 1200 | - | | | |
| **Capacity of All Piles** | | | | | = | **387600**kN | |
| **Demand / Capacity- DL + LL** | | | | | = | **0.42** | **Okay** |
| **Demand / Capacity- DL + LL + EQ** | | | | | = | **0.72** | **Okay** |

### 6.2.9 RETROFITTING METHODOLOGY

From Fig – 3.6, class – β columns & walls can be identified, similarly from Fig- 3.7, *Class δ* – columns & walls can be identified, the extra reinforcements and cross –sectional area required to maintain a stress ratio of 0.85 is provided below. Fig – 4.1 shows the typical encasement details on all sides of rectangular column / wall section, fig – 4.2 shows the typical encasement details on all sides for square columns, Fig – 4.3 shows the typical encasement details on one longer side of columns / walls & Fig 4.4 shows the typical encasement details on three sides of columns/walls. The additional reinforcements required for all columns and walls are shown on Table 4.1 & Table 4.2.

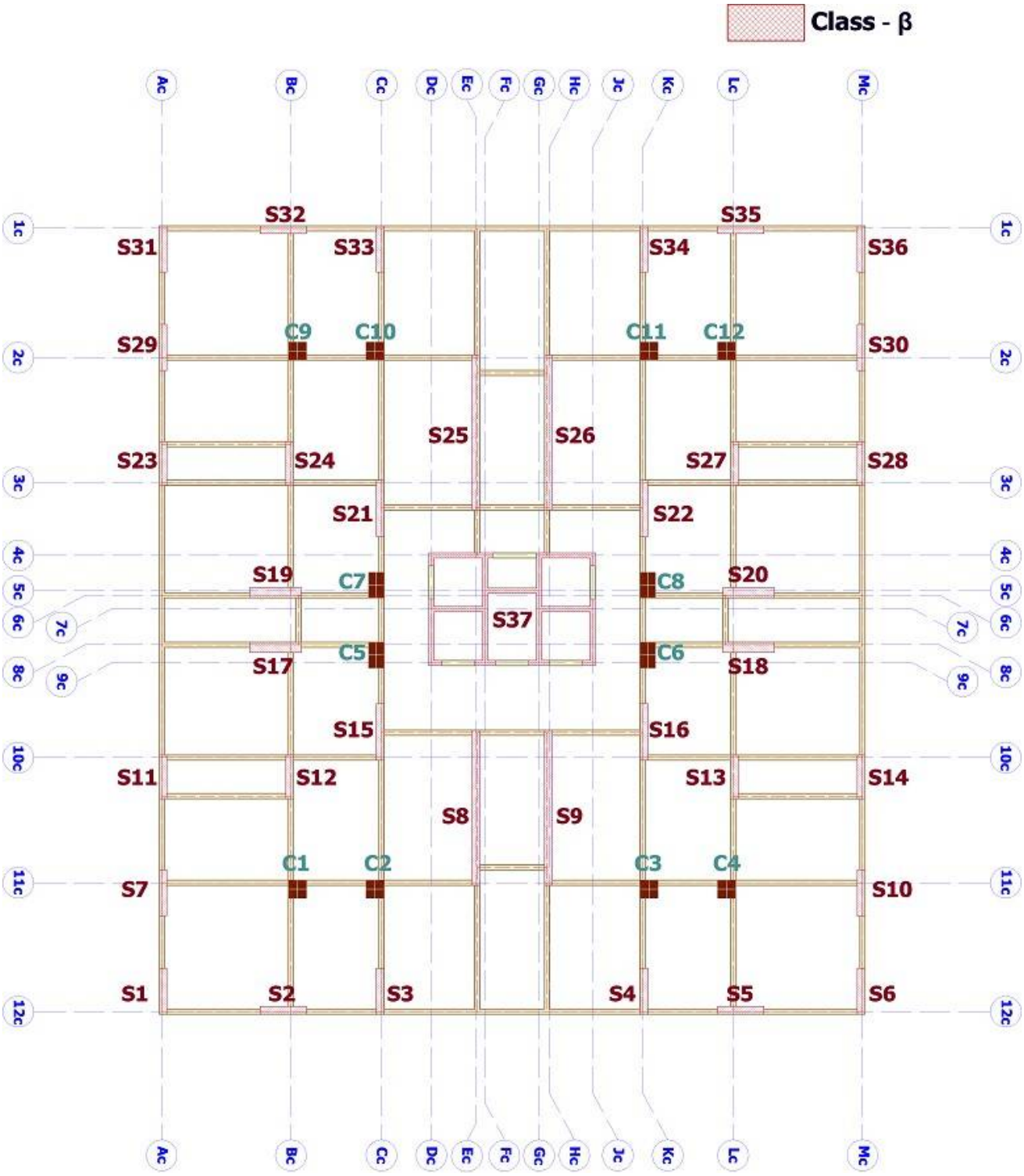



*Fig :3.6 Class β- columns & walls layout- Tower C*

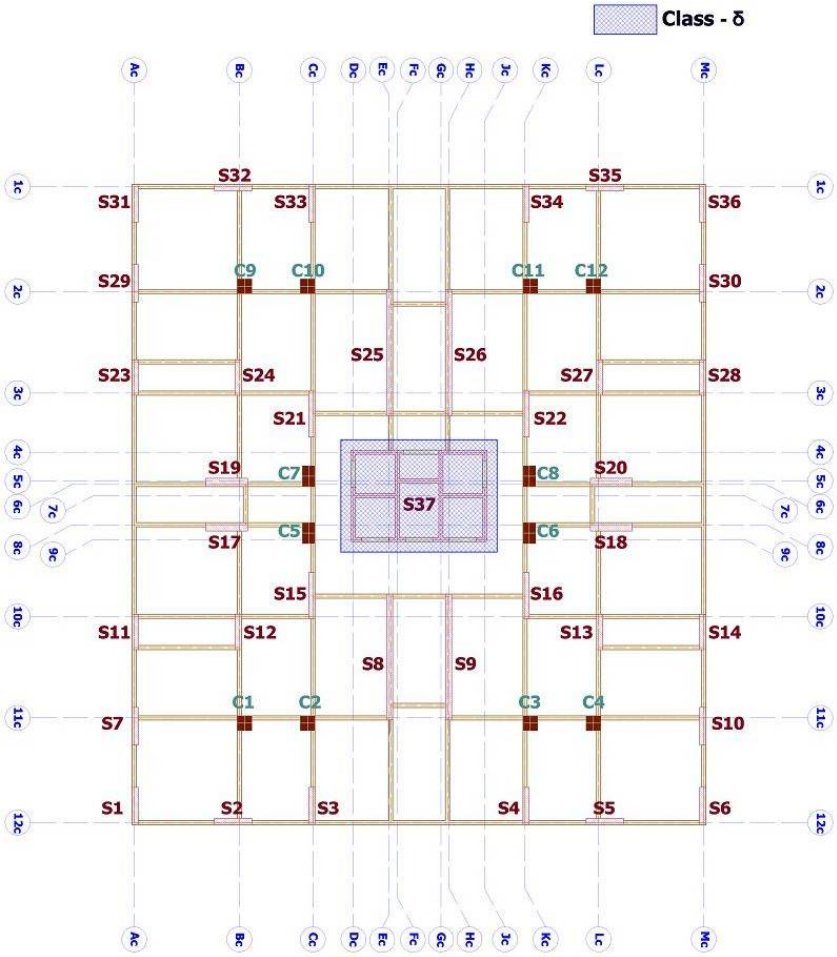



*Fig 3.7 Class δ - columns & walls layout- Tower C*

***Figure 4.1 – Typical encasement details for rectangular columns / walls***

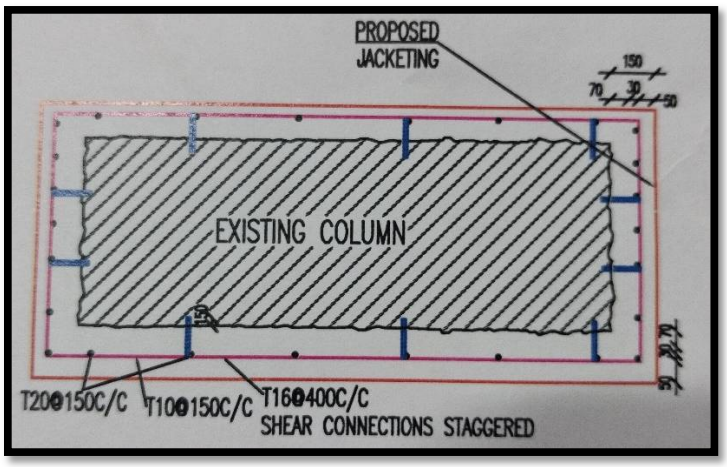



***Figure 4.2 – Typical encasement details for square column***

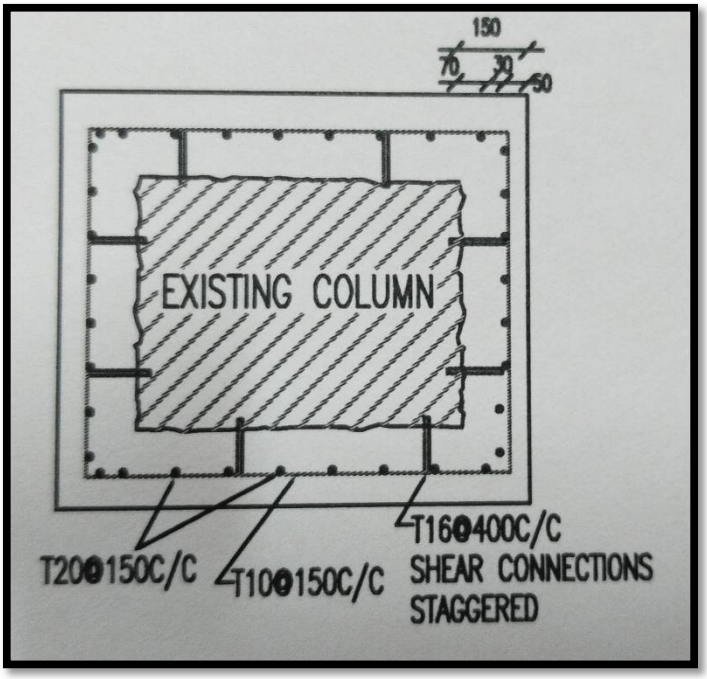
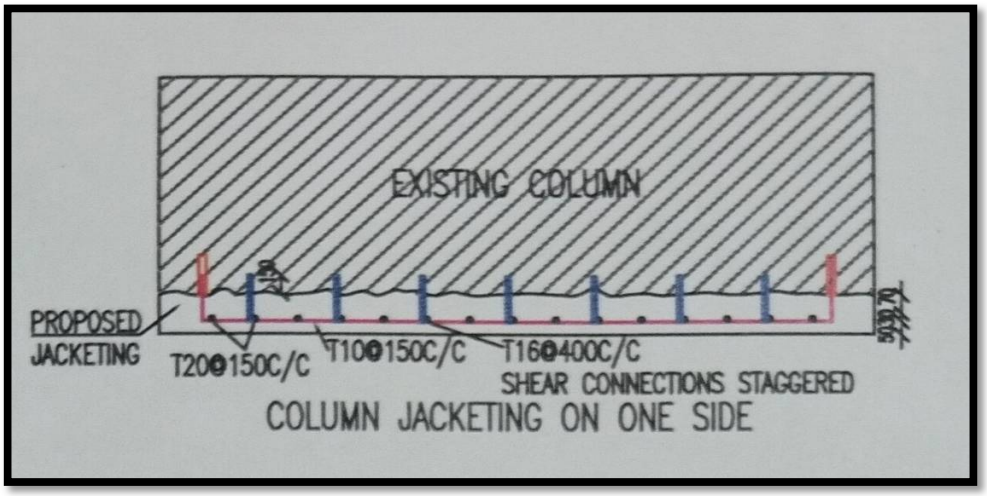



*Figure 4.3 – Typical encasement details for rectangular columns (One side only)*




It is observed from the table 4.1 & 4.2 the proposed methodology for strengthening of columns and shear wall is found acceptable. The design requirement and calculation of jacketing thickness and reinforcement required in the jacketing is to furnished.

The other columns and shear walls require strengthening based analysis and design, & utilization ratio are given Annexure 9 & 10.

*Table 4.1 – Additional reinforcements for columns / walls as per Floor-wise*

| AWHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| BF-GF | | | | | | Sheet 1 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S1 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 2 | S2 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 3 | S3 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 4 | S4 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 5 | S5 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 6 | S6 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 7 | S7 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 8 | S8 | 300 | 6045 | 600 | 6345 | T16 | @ 150 mm C/C |
| 9 | S9 | 300 | 6045 | 600 | 6345 | T16 | @ 150 mm C/C |
| 10 | S10 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 11 | S11 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 12 | S12 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 13 | S13 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 14 | S14 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 15 | S15 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 16 | S16 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 17 | S17 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 18 | S18 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 19 | S19 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 20 | S20 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 21 | S21 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 22 | S22 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 23 | S23 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 24 | S24 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 25 | S25 | 300 | 6045 | 600 | 6345 | T25 | @ 100 mm C/C |
| 26 | S26 | 300 | 6045 | 600 | 6345 | T25 | @ 100 mm C/C |
| 27 | S27 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 28 | S28 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 29 | S29 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 30 | S30 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 31 | S31 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 32 | S32 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 33 | S33 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 34 | S34 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 35 | S35 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 36 | S36 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 37 | S37 | | | | | | |

**Note: Provide T10 @150c/c for horizontal Bars**

*Table 4.1 – Additional reinforcements for columns / walls Floor-wise (Contd…)*

| AWHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| GF-1F | | | | | | Sheet 2 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S1 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 2 | S2 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 3 | S3 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 4 | S4 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 5 | S5 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 6 | S6 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 7 | S7 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 8 | S8 | 300 | 6045 | 600 | 6345 | T16 | @ 150 mm C/C |
| 9 | S9 | 300 | 6045 | 600 | 6345 | T16 | @ 150 mm C/C |
| 10 | S10 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 11 | S11 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 12 | S12 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 13 | S13 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 14 | S14 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 15 | S15 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 16 | S16 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 17 | S17 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 18 | S18 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 19 | S19 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 20 | S20 | 400 | 2200 | 700 | 2500 | T16 | @ 150 mm C/C |
| 21 | S21 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 22 | S22 | 300 | 2200 | 600 | 2500 | T16 | @ 150 mm C/C |
| 23 | S23 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 24 | S24 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 25 | S25 | 300 | 6045 | 600 | 6345 | T25 | @ 100 mm C/C |
| 26 | S26 | 300 | 6045 | 600 | 6345 | T25 | @ 100 mm C/C |
| 27 | S27 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 28 | S28 | 300 | 1700 | 600 | 2000 | T16 | @ 150 mm C/C |
| 29 | S29 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 30 | S30 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 31 | S31 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 32 | S32 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 33 | S33 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 34 | S34 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 35 | S35 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 36 | S36 | 300 | 1800 | 600 | 2100 | T16 | @ 150 mm C/C |
| 37 | S37 | 200 | | | | | |

**Note: Provide T10 @150c/c for horizontal Bars**

*Table 4.1 – Additional reinforcements for columns / walls Floor-wise (Contd…)*

| AWHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1F-6F | | | | | | Sheet 3 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S1 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 2 | S2 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 3 | S3 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 4 | S4 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 5 | S5 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 6 | S6 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 7 | S7 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 8 | S8 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 9 | S9 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 10 | S10 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 11 | S11 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 12 | S12 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 13 | S13 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 14 | S14 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 15 | S15 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 16 | S16 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 17 | S17 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 18 | S18 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 19 | S19 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 20 | S20 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 21 | S21 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 22 | S22 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 23 | S23 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 24 | S24 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 25 | S25 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 26 | S26 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 27 | S27 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 28 | S28 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 29 | S29 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 30 | S30 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 31 | S31 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 32 | S32 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 33 | S33 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 34 | S34 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 35 | S35 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 36 | S36 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 37 | S37 | | | | | | |

Note: Provide T10 @150c/c for horizontal Bars

*Table 4.1 – Additional reinforcements for columns / walls Floor-wise (Contd…)*

| WHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6F-10F | | | | | | Sheet 4 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S1 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 2 | S2 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 3 | S3 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 4 | S4 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 5 | S5 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 6 | S6 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 7 | S7 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 8 | S8 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 9 | S9 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 10 | S10 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 11 | S11 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 12 | S12 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 13 | S13 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 14 | S14 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 15 | S15 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 16 | S16 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 17 | S17 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 18 | S18 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 19 | S19 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 20 | S20 | 400 | 2200 | 600 | 2400 | T12 | @ 150 mm C/C |
| 21 | S21 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 22 | S22 | 300 | 2200 | 500 | 2400 | T12 | @ 150 mm C/C |
| 23 | S23 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 24 | S24 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 25 | S25 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 26 | S26 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 27 | S27 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 28 | S28 | 300 | 1700 | 500 | 1900 | T12 | @ 150 mm C/C |
| 29 | S29 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 30 | S30 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 31 | S31 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 32 | S32 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 33 | S33 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 34 | S34 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 35 | S35 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 36 | S36 | 300 | 1800 | 500 | 2000 | T12 | @ 150 mm C/C |
| 37 | S37 | 200 | | | 200 | T12 | @ 150 mm C/C |

**Note: Provide T10 @150c/c for horizontal Bars**

*Table 4.1 – Additional reinforcements for columns / walls Floor-wise (Contd…)*

| AWHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10F-14F | | | | | | Sheet 5 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S1 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 2 | S2 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 3 | S3 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 4 | S4 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 5 | S5 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 6 | S6 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 7 | S7 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 8 | S8 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 9 | S9 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 10 | S10 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 11 | S11 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 12 | S12 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 13 | S13 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 14 | S14 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 15 | S15 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 16 | S16 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 17 | S17 | 400 | 1600 | 600 | 1800 | T12 | @ 150 mm C/C |
| 18 | S18 | 400 | 1600 | 600 | 1800 | T12 | @ 150 mm C/C |
| 19 | S19 | 400 | 1600 | 600 | 1800 | T12 | @ 150 mm C/C |
| 20 | S20 | 400 | 1600 | 600 | 1800 | T12 | @ 150 mm C/C |
| 21 | S21 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 22 | S22 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 23 | S23 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 24 | S24 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 25 | S25 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 26 | S26 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 27 | S27 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 28 | S28 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 29 | S29 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 30 | S30 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 31 | S31 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 32 | S32 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 33 | S33 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 34 | S34 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 35 | S35 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 36 | S36 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 37 | S37 | | | | | | |

**Note: Provide T10 @150c/c for horizontal Bars**

*Table 4.1 – Additional reinforcements for columns / walls Floor-wise (Contd…)*

| AWHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14F-22F | | | | | | Sheet 6 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S1 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 2 | S2 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 3 | S3 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 4 | S4 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 5 | S5 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 6 | S6 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 7 | S7 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 8 | S8 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 9 | S9 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 10 | S10 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 11 | S11 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 12 | S12 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 13 | S13 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 14 | S14 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 15 | S15 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 16 | S16 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 17 | S17 | 400 | 1500 | 600 | 1700 | T12 | @ 150 mm C/C |
| 18 | S18 | 400 | 1500 | 600 | 1700 | T12 | @ 150 mm C/C |
| 19 | S19 | 400 | 1500 | 600 | 1700 | T12 | @ 150 mm C/C |
| 20 | S20 | 400 | 1500 | 600 | 1700 | T12 | @ 150 mm C/C |
| 21 | S21 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 22 | S22 | 300 | 1600 | 500 | 1800 | T12 | @ 150 mm C/C |
| 23 | S23 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 24 | S24 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 25 | S25 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 26 | S26 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 27 | S27 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 28 | S28 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 29 | S29 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 30 | S30 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 31 | S31 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 32 | S32 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 33 | S33 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 34 | S34 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 35 | S35 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 36 | S36 | 300 | 1200 | 500 | 1400 | T12 | @ 150 mm C/C |
| 37 | S37 | 200 | | | 200 | T12 | @ 150 mm C/C |

Note: Provide T10 @150c/c for horizontal Bars

*Table 4.1 – Additional reinforcements for columns / walls Floor-wise (Contd…)*

| AWHO-TOWER C-Shear Wall Strengthening Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22F-26F | | | | | | Sheet 7 of 7 | |
| Sl:No. | SW ID | Actual Size | | Increased Size | | Strengthening Reinforcement | |
| | | t (mm) | L (mm) | t1 (mm) | L1 (mm) | | |
| 1 | S8 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 2 | S9 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 3 | S25 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |
| 4 | S26 | 300 | 6045 | 500 | 6245 | T12 | @ 150 mm C/C |

Note: Provide T10 @150c/c for horizontal Bars

1. The retrofitting process on Class β (pronounced as 'Beta') members can be done only after reducing the vertical loads on the structure. Since we cannot reduce the dead load on the structure, it is advised to reduce the live loads on the structure(if possible) while doing the retrofitting on Class β members.
2. It is recommended to do retrofit only 25 percent of Class β members at a time, since they carry the dead loads and lives loads on the structure.
3. It is recommended to do retrofit only 25 percent of Class δ (pronounced as 'Delta') members at a time, since they carry the lateral loads on the structure.
4. Vehicle traffic within the basement and stilt floors shall be avoided during the retrofitting process, so as to avoid vibrations to the temporary support structures.
5. The electrical, plumbing and fire service lines provided in the basement floors as well as the stilt floors will have to be rerouted to aid the temporary support structures and retrofitting process.

### 6.2.10 DESIGN CONCLUSION

1. The scope of work of BV is to establish Condition Assessment of Structure conducting NDT tests and based on NDT results the distress level of the structural components Structural Assessment of Tower B & C. To provide BOQ for the retrofitting works and to propose 3 contractors for retrofitting works. There is no binding for BV in deciding the retrofitting contractors and the status of the building with distress and continued distress and it is sole responsibility of AWHO.
2. Structural Assessment of Tower C with preparation of ETABS Models without distress (100% health condition) and ETABS Model with distress considering reduction in area of steel due to corrosion.

3. The hard copies of the GFC drawings, soil report, Pile testing details, Pile and pile cap details, slabs and beam details were made available to Bureau Veritas. The same GFC drawings were used in evaluating the capacity of the structural elements with & without distress.
4. ***The building is located in very severe environment as per IS456, Cl 8.2.2.1 and table 3. From the drawings, it is observed that cover provided for columns and walls are on lesser side, which will have direct impact on durability of structure.***
5. Prepared ETABS model without and with distress and used in Demand and Capacity of Structural evaluation for Gravity Loads and Lateral Loads. We have done analysis and design for tower –C with the following load combinations

| |
|---|
| a) Without distress ETABS Model for Tower C – Gravity Loading |
| b) With Distress ETABS Model for Tower C- Gravity Loading |
| c) Without distress ETABS Model for Tower C – Lateral Loading |
| d) With Distress ETABS Model for Tower C- Lateral Loading |

6. The reinforcement provided in the GFC drawings supplied to us are used in evaluation of capacity and demand of columns and shear walls for towers C with and without distress.
7. The proposed percentage reduction in main reinforcement is about 5% to 10% and 50% reduction in diameter of the bars for stirrups/rings of the vertical structural members(columns and shear walls) due to corrosion.
8. Based on The NDT results, the actual compressive strength of concrete 25MPa (M25 Grade) is considered in the structural members for analysis and design.
9. Demand vs Capacity of Columns and Shear without distress is provided from basement floor to terrace level i.e all the floors. Based on design strength of concrete and reinforcement in the GFC is used in the analysis of all the floors in the ETABS model.
10. Demand vs Capacity of Columns and Shear with distress is provided from basement floor to terrace level i.e all the floors. The actual compressive strength of concrete obtained from NDT and reduced cross section of the reinforcement provided in GFC due to corrosion of rebars is used in the analysis of all the floors in the ETABS model.
11. *The strengthening of columns, shear wall, Beams and slabs is required as per the design requirement for without and with distress condition.*

12. Strengthening of all columns and Shear Wall are proposed from basement floor and above are given in **Table No.4.1.** The main vertical bars shall be T25/T16/T12 per the design requirement and T10 @ 150 c/c as tie reinforcement.
13. Design deficiency in beams and slabs are furnished in Annexure 13 to 18 and based on the distress condition due to degradation beams and slabs calls for strengthening measures as detailed in sketches.
14. The retrofitting process on Class β (pronounced as 'Beta') members can be done only after reducing the vertical loads on the structure. Since we cannot reduce the dead load on the structure, it is advised to reduce the live loads on the structure(if possible) while doing the retrofitting on Class β members.
15. It is recommended to do retrofit only 25 percent of Class β members at a time, since they carry the dead loads and lives loads on the structure.
16. It is recommended to do retrofit only 25 percent of Class δ (pronounced as 'Delta') members at a time, since they carry the lateral loads on the structure.
17. Vehicle traffic within the basement and stilt floors shall be avoided during the retrofitting process, so as to avoid vibrations to the temporary support structures.
18. The electrical, plumbing and fire service lines provided in the basement floors as well as the stilt floors will have to be rerouted to aid the temporary support structures and retrofitting process.
19. The columns and Shear Walls strengthening proposed is given in Annexure 9 & 10.
20. Strengthening of Beams and slabs are presented in sketches.
21. The strengthening proposed on one side, two sides, three sides and four sides of the columns and shear walls based on the feasibility and integrity with other elements. The capacity of strengthened structural members columns and Shear walls are given Table 4.1.
22. Attempt to evaluate the strength/quality of pile and pile caps were made, but due to presence of high-water table evaluation below couldn't be carried out. During the process of evaluation water started oozing out from the floor slab. Oozed out water from the flooring was collected and subjected to test to understand the impact of water on the pile foundation. However, based on the theoretical analysis foundation with pile and pile cap is found to be adequate.
23. M/s Bureau Veritas is not responsible for the distress of the structural members and continued distress if any; AWHO shall appoint experienced retrofitting contractors to carry out the retrofitting works as proposed.

24. The retrofitting suggested in this report is considering the present state of distress of the structure. If a distress (other than that is mentioned in this report) occurs in the structure at a later stage, then suitable retrofitting/rehabilitation work shall be designed and envisaged, which is out of the scope.
25. An active or passive structural health monitoring system can be incorporated on the retrofitted structural elements to monitor the performance of the members after retrofitting, though the design and instrumentation for the same is out of the scope of our study.
26. Tower C is having more distress compared to Tower B, Tower C is to be considered for strengthening on priority.
27. The main cause of distress to the structure is attributed to the enhanced rate of corrosion of steel reinforcement. This is due to the high chloride content in concrete and high rate of carbonation of cover concrete, as evident from the test results given in Bureau Veritas Report. While adopting the retrofitting process, it is recommended to provide proper Cathodic protection to the steel reinforcement, so as to avoid chances of corrosion of reinforcement in future. An expert opinion on procedure adopted for Cathodic protection shall be taken and the same shall be added suitably adopted.

## 11.0 SERVICE LIFE EVALUATION

The exceptional durability of Portland Cement Concrete is a major reason why it is the world's most widely used construction material. But material limitations, design and construction practices, and severe exposure conditions can cause concrete to deteriorate, which may result in aesthetic, functional, or structural problems. Concrete can deteriorate for a variety of reasons, and concrete damage is often the result of a combination of factors.

Generally, for any RC structure that built will have Design Life and Service Life. Distinction needs to be made between Service Life and Design Life, the design life is a period considered (possibly longer than the service life) that will give sufficiently high probability of the structure achieving the required service life. The design life would depend upon the importance of the structure. It would ensure required safety against falling below the target service life. Refer Table A for proposed targeted service life of structures - Euro Code 1(CEN 1994).

The service life of a RC structure is characterized as the time after establishment/construction until such time when expensive repair gets to be essential due to degradation of concrete and steel. The service life of structure, period at which the expected performance of structure fails to meet the design requirement RC building. For RC structures in marine situations, the resistance of concrete to chloride actuated degradation to a great extent controls its long haul strength execution. Concrete weakening because of chloride-induced deterioration can be explained to by a basic service life model comprising of an initiation (start) stage and propagation (spread stage)

Concrete structures are typically exposed to severe environmental and structural loading conditions. Typically, concrete structures have the ability to prevent deterioration for long periods of time. However, premature corrosion and the resulting deterioration in the strength and serviceability performance of concrete structures can occur due to the use of poor quality materials and poor construction practices.

Procedures are available in the literature to predict the service life in the case of building materials and components. In fact there cannot be one general procedure for all types of buildings and environments. Considering the history and the environmental

conditions the procedure will require modification. The deterioration and actual damage levels differ from structure to structure, making it impossible to lay down a strict framework of the procedure and factors that would affect the safety and serviceability of the RC building, in spite of periodic routine maintenance, are required to estimate the remaining life.

**Table A. Design Life of Structure**

Euro -Code-1( CEN-1994) Presents the classification for the target service life as shown below:

| Class | Target Service Life (Years) | Example |
|---|---|---|
| 1. | 1-5 | Temporary structures |
| 2. | 25 | Replaceable structural parts, e.g., bearings |
| 3. | 50 | Building structures and other common structures |
| 4. | 100 | Monumental building structures, bridges and other civil engineering structures |

## 11.1 Causes of Degradation of RC Structures

There are many factors contributing to the degradation of RC structure such as

1. Faulty Design
2. Use of Poor Quality Material
3. Poor Construction Practice
4. Poor Construction Sequence
5. Unskilled Labours
6. Poor Quality Control
7. Ignoring Environmental Conditions & Impact
8. Non Compliance to Standard Code
9. Change in usage of the Building( increase in Load)
10. Chemical Attack/ Resistance

## 11.2 Corrosion of rebars in RC structures

The high-rise Chander Kunj residential Army towers- Tower C with 27 storeys was reported to be constructed in 2017-18 and distress is observed in the RC structural

elements due to corrosion of rebar which resulted in durability issue of the structure. Half-cell potential measurement tests and electrical resistivity tests were carried out to know the extent of corrosion, Profometer test was carried out to assess cover to reinforcement, diameter and spacing of bar, cylindrical cores extracted from RC members were used to assess the compressive strength, establish chloride and sulphate content in the concrete and pH value of pore solutions

In reinforced concrete structures, the pore solution surrounding the reinforcements attains a pH of 12.6 after completion of the hydration reaction. The high alkalinity is buffered at this pH by calcium hydroxide in a lime-rich layer (passive layer) in intimate contact with the surface of the reinforcements. So far, the alkalinity remains at a high pH and the rebars also remain free from corrosion.

Moisture, oxygen dissolved in moisture and aggressive ions (particularly chlorides) are the three important factors necessary to induce corrosion of reinforcement. If oxygen and water are eliminated completely then corrosion will be arrested completely. However, it is normally impossible to eliminate oxygen or moisture from the RC structural elements because these species are inherently present in the structure. But it is possible to remove the aggressive ions (particularly chlorides) from the existing structures by a desalination process or by adding suitable chloride inhibitors.

The reinforcement corrosion is the main cause for the RC structures deterioration, which will result in major durability issue. The corrosion phenomenon is mainly due to two main considerations, which cause reinforcement degradation in concrete to an unsatisfactory degree i.e., (i) Carbonation,

(ii) Chloride induced corrosion.

Carbonation induced corrosion most commonly occurs in relatively dry environments where sufficient carbon oxide to diffuse into the cover concrete is possible. However, in chloride containing environments, the chloride ingress is usually faster than the carbonation process, and it is more likely to cause premature deterioration by degrading the resistance of the structure leading to reduced life of structure.

## 11.3 Carbonation of Concrete

Carbonation occurs when carbon dioxide from the air penetrates the concrete and reacts with hydroxides, such as calcium hydroxide, to form carbonates. In the reaction with calcium hydroxide, calcium carbonate is formed:

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

This reaction reduces the pH of the pore solution to as low as 8.5, at which level the passive film on the steel is not stable. Carbonation is generally a slow process. In high-quality concrete, it has been estimated that carbonation will proceed at a rate up to 1.0 mm (0.04 in.) per year. The amount of carbonation is significantly increased in concrete with a high water-to-cement ratio, low cement content, short curing period, low strength, and highly permeable or porous paste. Carbonation is highly dependent on the relative humidity of the concrete. The highest rates of carbonation occur when the relative humidity is maintained between 50% and 75%. Below 25% relative humidity, the degree of carbonation that takes place is considered insignificant. Above 75% relative humidity, moisture in the pores restricts CO2 penetration (ACI 201 1992). Carbonation-induced corrosion often occurs on areas of building facades that are exposed to rainfall, shaded from sunlight, and have low concrete cover over the reinforcing steel.

## 11.4 Chloride Induced Corrosion

The existence of chloride in concrete structures is due to

- Its use as an accelerator in the concrete mix,
- The presence of a marine atmosphere and
- The use of deicing salts.
- Use of salt water in Concrete Mix
- Use of aggregate with salt component

Chloride occurs in concrete in three forms: (i) chemically bound, (ii) physically adsorbed and (iii) free chloride. The free chlorides are mainly responsible for rebar corrosion. If the free chloride to hydroxide ratio exceeds 0.6, loss of passivity occurs and corrosion progresses. The presence of free chloride not only alters the Pourbaix equilibrium diagram,

it reduces the area of the passive region as shown in Fig A & B, but also transfer the rebar from the passive to the active region.

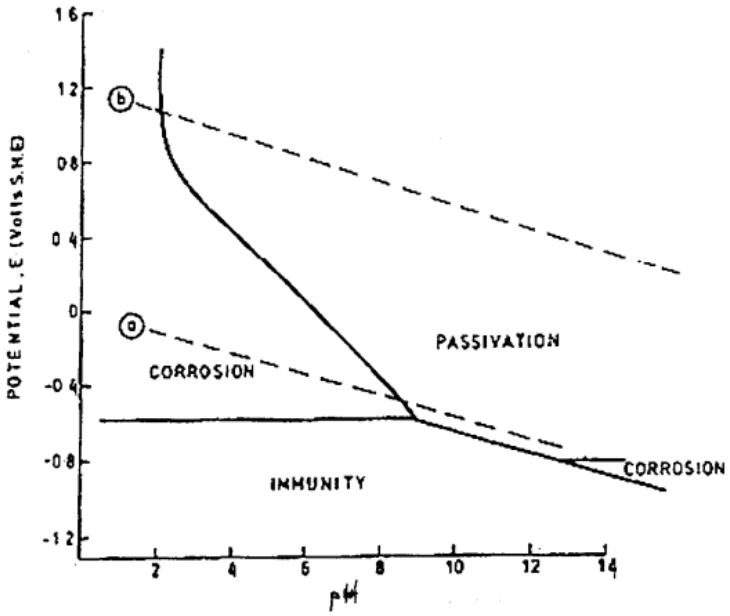



**Fig A. Effect of PH value on paasive layer**

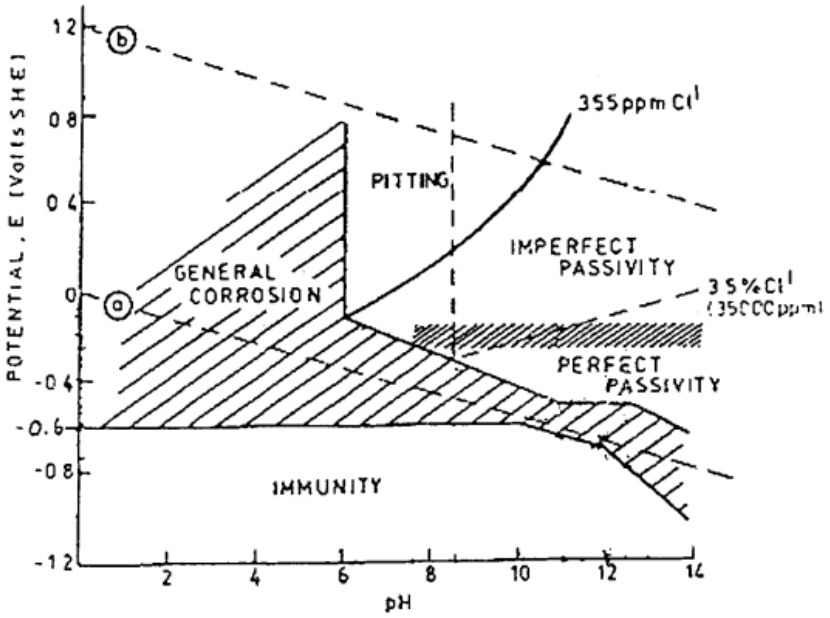



**Fig B. Effect of PH value on paasive layer & Chloride**

The corrosion reactions occurring can be represented as follows

$Fe \rightarrow Fe^{2+} + 2\ e^-$

$O_2 + 2\ H_2O + 4\ e^- \rightarrow 4\ OH^-$

$Fe^{2+} + 2\ OH^- \rightarrow Fe(OH)_2$ white corrosion product

$4Fe(OH)_2 + 2H_2O + O_2 \rightarrow 4\ Fe(OH)_3$ Red Rust

$3\ Fe + 8\ OH^- \rightarrow Fe_3O_4 + 4H_2O + 8\ e^-$ Black rust

At high chloride concentrations

$Fe + 2\ Cl^- \rightarrow FeCl_2 \rightarrow Fe^{++} + 2\ Cl^- + 2\ e^-$ Yellowish green

$O_2 + 2H_2O + 4\ e^- \rightarrow 4\ OH^-$

$6\ FeCl_2 + O_2 + 6H_2O \rightarrow 2\ Fe_3O_4 + 12H^+ + 12\ Cl^-$

Fig C & D shows a schematic illustration of the full pitting corrosion process. It is important to mention that the presence of oxygen and moisture is necessary for the precedence of corrosion process. The absence of one of them will terminate the progress of corrosion.

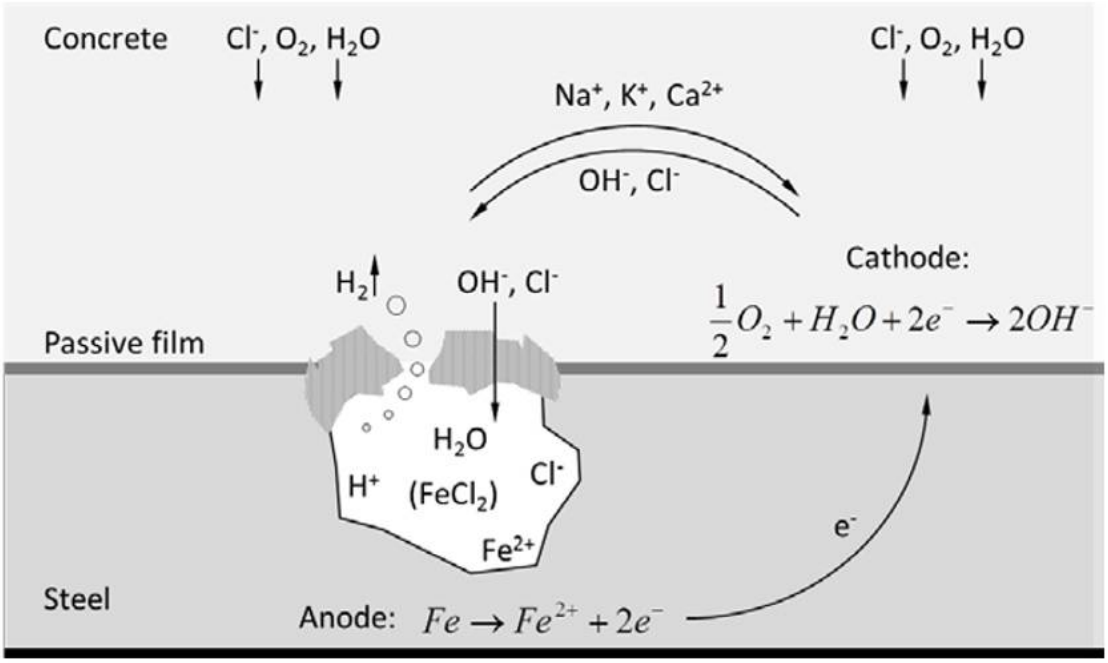


**Fig C:** When reinforcing steel corrodes, electrons flow through the bar and ions flow through the concrete.

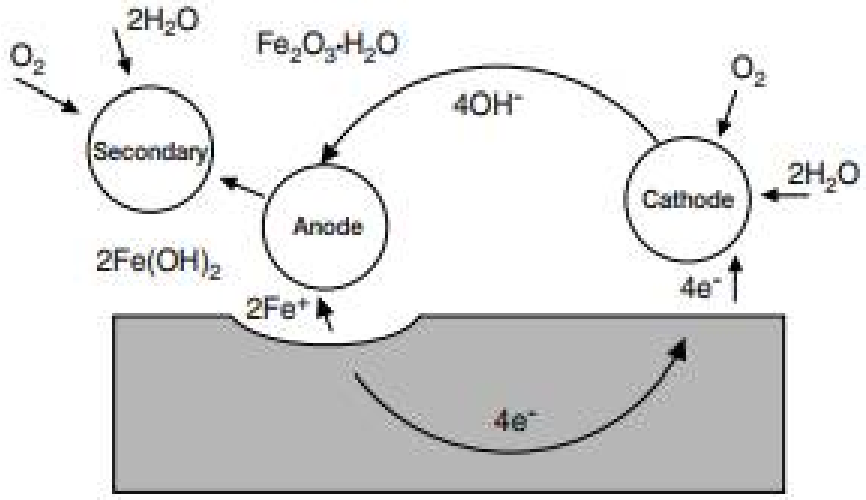



Fig D: When reinforcing steel corrodes, electrons flow through the bar and ions flow through the concrete.

## 11.5 Concrete and the Passivating Layer

Although steel's natural tendency is to undergo corrosion reactions, the alkaline environment of concrete (pH of 12 to 13) provides steel with corrosion protection. At the high pH, a thin oxide layer forms on the steel and prevents metal atoms from dissolving. This passive film does not actually stop corrosion; it reduces the corrosion rate to an insignificant level. For steel in concrete, the passive corrosion rate is typically 0.1 µm per year. Without the passive film, the steel would corrode at rates at least 1,000 times higher (ACI 222 2001). Because of concrete's inherent protection, reinforcing steel does not corrode in the majority of concrete elements and structures. However, corrosion can occur when the passivating layer is destroyed. The destruction of the passivating layer occurs when the alkalinity of the concrete is reduced or when the chloride concentration in concrete is increased to a certain level.

## 11.6 The Role of Chloride Ions

Exposure of reinforced concrete to chloride ions is the primary cause of premature corrosion of steel reinforcement. The intrusion of chloride ions, present in deicing salts and seawater, into reinforced concrete can cause steel corrosion if oxygen and moisture are also available to sustain the reaction. Chlorides dissolved in water can permeate through sound concrete or reach the steel through cracks. Chloride-containing admixtures can also cause corrosion. No other contaminant is documented as extensively in the literature as a cause of corrosion of metals in concrete than chloride ions.

The mechanism by which chlorides promote corrosion is not entirely understood, but the most popular theory is that chloride ions penetrate the protective oxide film easier than do other ions, leaving the steel vulnerable to corrosion. The risk of corrosion increases as the chloride content of concrete increases. When the chloride content at the surface of the steel exceeds a certain limit, called the threshold value, corrosion will occur if water and oxygen are also available. Federal Highway Administration (FHWA) studies found that a threshold limit of 0.20% total (acid-soluble) chloride by weight of cement could induce corrosion of reinforcing steel in bridge decks (Clear 1976). However, only water-soluble chlorides promote corrosion; some acid-soluble chlorides may be bound within aggregates and, therefore, unavailable to promote corrosion. Work at the FHWA (Clear 1973) found that the conversion factor from acid-soluble to water soluble chlorides could range from 0.35 to 0.90, depending on the constituents and history of the concrete. Arbitrarily, 0.75 was chosen, resulting in a water-soluble chloride limit of 0.15 % by weight of cement. Table 2 shows the maximum permissible water soluble chloride-ion content for reinforced concrete in various exposure conditions (ACI 318 2002). Although chlorides are directly responsible for the initiation of corrosion, they appear to play only an indirect role in the rate of corrosion after initiation. The primary rate-controlling factors are the availability of oxygen, the electrical resistivity and relative humidity of the concrete, and the pH and temperature.

3 Types and Causes of Concrete Deterioration Fig. 4. Deicing salts are a major cause of corrosion of reinforcing steel in concrete. (55807) Table 2. Maximum Chloride Ion Content of Concrete (ACI 318) Maximum Type of Member Cl-* Prestressed concrete 0.06 Reinforced concrete exposed to chloride in service 0.15 Reinforced concrete that will be dry or protected from moisture in service 1.00 Other reinforced concrete construction 0.30 *Water-soluble chloride, percent by weight of cement.

## 11.7 Volumetric expansion ratio of corrosion products

Corrosion of reinforcing steel and other embedded metals is the leading cause of deterioration in concrete. When steel corrodes, the resulting rust occupies a greater volume than the steel. This expansion creates tensile stresses in the concrete, which can eventually cause cracking, delamination, and spalling. Steel corrodes because it is not a naturally occurring material. Rather, iron ore is smelted and refined to produce steel. The production steps that transform iron ore into steel add energy to the metal. Steel, like most metals except gold and platinum, is thermodynamically unstable under normal atmospheric conditions and will release energy and revert back to its natural state—iron oxide, or rust. This process is called corrosion.

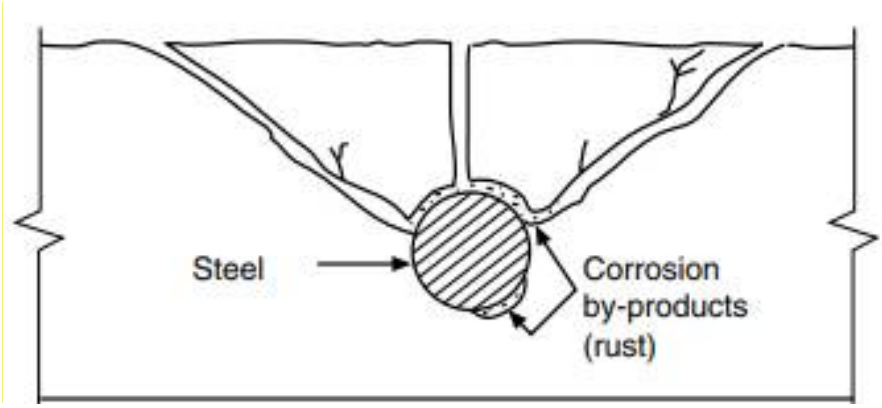



**Fig E.: The expansion of corroding steel creates tensile stresses in the concrete, Which can cause cracking, delamination, and spalling.**

The amount of volume increase in corroding reinforcing bar varies according to the types of oxidation products. Table. B presents values of the volumetric expansion ratio reported by Oh et al. (2009), Takaya et al. (2012), Mehta and Monteiro (1997) and Suda et al. (1993). This summary indicates that the product of Calcium Iron Oxide (III) Chloride is observed only in the electrically induced corrosion with the presence of chloride ions, and its volumetric expansion rate is 6.9 (Takaya et al. 2012). This product not only has a higher volumetric expansion ratio but also is the agent which has much to do with the kinematics of corrosion gel. In the range of 10 - 15 mM/l chloride, iron solubility at PH ~ (12-13) increases abruptly from near zero to 170 to 180 mM/l (Sagoe-Crentsil and Glasser 1989). This chloro-complex, where iron and chloride ions are bound together, is observed to migrate away from the

corroding steel bar and subsequently precipitate in oxygen-rich areas, releasing the chlorides to transport more ferrous ions from the corrosion steel (Sagoe-Crentsil and Glasser 1989). These facts highlight that the approaches based solely on a single volumetric expansion ratio may not be realistic to simulate corrosion induced damage of structural concrete for all conditions. These are because the degree of volumetric expansion may reach up to 5 times even more for the electrically accelerated cases in the presence of chloride ion. Here, the authors use different expansion ratio depending on the method adopted to induce corrosion and depending on the presence or absence of chloride ions.

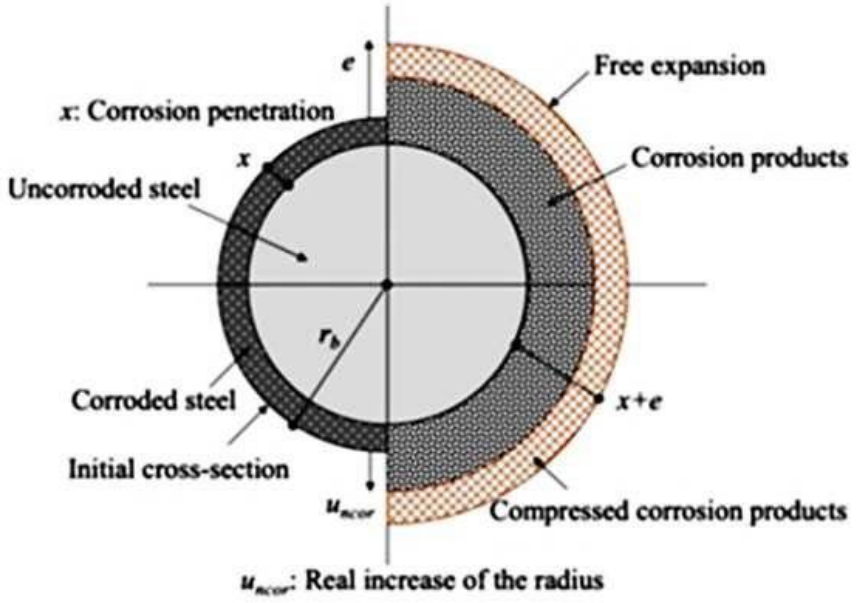



**Fig F.: The expansion of corroding & Volumetric change**

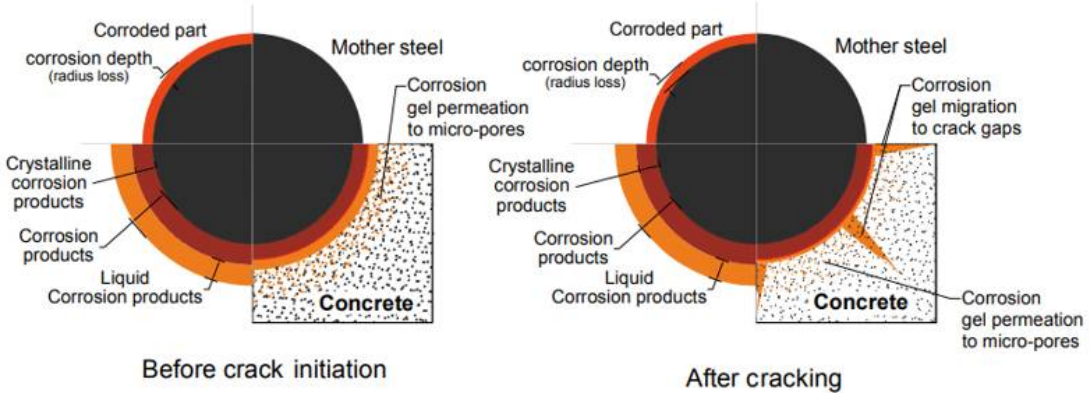



Fig.G Crystalized and Liquid Phases of corrosion products in Chloride Environment

**Table. B Volumetric change ratio of rust products**

| Corrosion products | Expansion ratio Mehta/Oh | Corrosion products | | Expansion ratio Suda* | Expansion ratio Takaya** |
|---|---|---|---|---|---|
| FeO | 1.20/1.70 | Goethite | α-FeOOH | 2.9-3.8 | 2.9 |
| $Fe(OH)_2$ | 3.75/3.60 | Akaganeite | β-FeOOH | -- | 3.5 |
| $Fe_2O_3$ | 2.20/2.10 | Lepidocrocite | γ-FeOOH | 3.0 | 3.1 |
| $Fe_3O_4$ | 2.00/2.00 | Magnetite | $Fe_3O_4$ | 2.1 | 2.1 |
| $Fe(OH)_3$ | 4.20/4.00 | Calcium Iron Oxide (III) chloride | $CaFeO_2Cl$ | -- | 6.9 |
| $Fe(OH)_3.3H_2O$ | 6.40/6.15 | Iron chloride Hydroxide | $Fe_6Cl_{2-x}(OH)_{12+x}$ | -- | NA |

## 11.8 Fick's Law & Corrosion

Typically, the initiation phase is much longer than the propagation phase. Therefore, predicting the duration of initiation phase is important in predicting the overall service life of a concrete structure. During the initiation phase, the chloride ions in the surrounding environment penetrate through the cover concrete and reach the reinforcement. As the concentration of accumulated chlorides at the reinforcement reaches a particular level (defined as the chloride threshold level or $C_{th}$), the corrosion is initiated. It has been identified the concrete cover depth (x), chloride diffusion coefficient (D) and chloride threshold ($C_{th}$) as the key parameters affecting the corrosion initiation time ($t_{initiation}$). Typically, the chloride penetration into concrete is described through diffusion phenomenon. Fick's 2nd law (Crank 1975) is commonly used to predict both steady and non-steady state migration of chloride ions in a porous medium such as concrete, as follows.

$$\frac{\partial C(x,t)}{\partial t} = D\frac{\partial^2 C(x,t)}{\partial x^2} \qquad \text{Eqn.1}$$

where C- Chloride concentration,

D - Chloride diffusion coefficient,

x - depth of penetration, and

t - exposure time.

Based on this, several models have been developed for predicting the service life of concrete structures exposed to chloride environments.

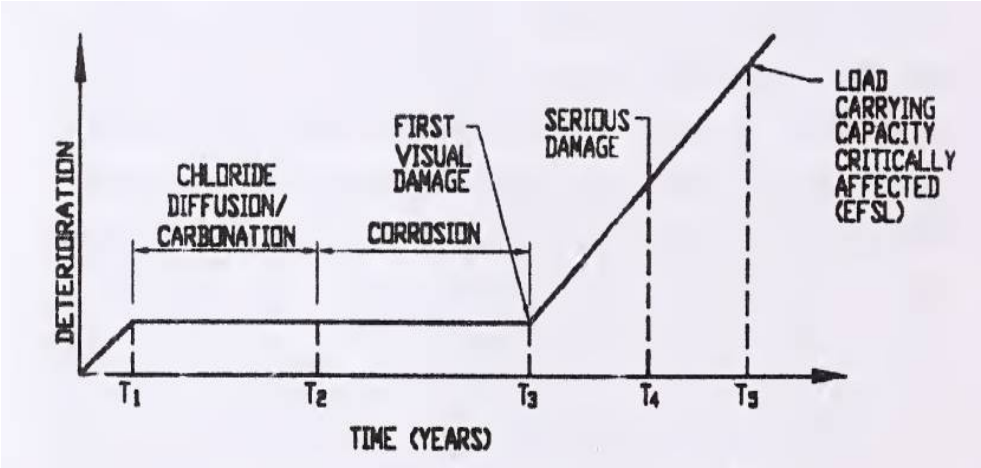



**Fig.H Time vs Deterioration –corrosion of rebars**

**Table: C Rate of Corrosion with effect of Chloride & Co2 and Relative Humidity**

| Relative Humidity (%) | Rate of corrosion in | |
|---|---|---|
| | Carbonated concrete (µm/year) | Chloride contaminated concrete (µm/year) |
| 99 | 2 | 34 |
| 95 (exposed to rain situation) | 50 | 122 |
| 90 (sheltered from rain situation) | 12 | 98 |
| 85 | 3 | 78 |
| 80 | 1 | 61 |
| 75 | 0.1 | 47 |
| 70 | 0 | 36 |
| 60 | 0 | 19 |
| 50 | 0 | 9 |

## 11.9 Threshold value of chloride in RC structure

Corrosion first begins when a certain chloride concentration has been reached around the steel. This concentration is called the threshold value. From this critical analysis of the threshold limit of chloride, it is concluded that the CI-/OH- ratio is not the appropriate index to predict rebar corrosion under all conditions. Other environmental parameters like alkalinity, oxygen availability and impermeability do play a significant role besides the CI-/OH- ratio.

Experiments carried out in the laboratory by exposing two grades of 1 concrete (lean mix concrete, rich mix concrete) to immersed conditions (seawater, potable water) and exposure conditions (indoor and outdoor weathering) revealed that in the case of lean mix concrete even though the CI-/OH ratio is found to be less than 0.6, severe corrosion occurred. On the other hand, in the case of rich mix concrete even though the $CI^-/OH^-$ ratio is found to be greater than 0.6, a negligible amount of corrosion was observed. In the case of the lean mix concrete, apart from the CI-/OH-ratio, porosity and low alkalinity also induce corrosion. On the other hand, in the case of the rich mix concrete, apart from the CI/OH- ratio the denser mix reduced the permeability of aggressive ions. The availability of oxygen at the steel surface is severely restricted by the low permeability of the rich mix concrete. Thus lean mix concrete decreases the threshold level of chloride, whereas rich mix concrete increases the threshold level of chloride to induce rebar corrosion.

Threshold Value of chloride content is expressed as a percentage on the basis of the weight of cement because cement constituents like calcium oxide and aluminium oxide play a major role in converting chloride from the Free State to the complexing state. In contrast, in the case of core samples collected from bridges and structures chloride content is expressed as a percentage on the basis of the weight of concrete as it is very difficult to find the cement content in existing structures. But from a corrosion point of view, only the free chloride content, not the total chloride content, is responsible for inducing rebar corrosion. In estimating the chloride content in concrete core samples, only the chloride content at the steel/concrete interface plays a major role in inducing passivity. But it is also very difficult to estimate the chloride content at the steel and concrete interface. Microelectrodes should be developed on the basis of ion elective electrodes to estimate the chloride content at the steel and concrete interface, because the steel and concrete interface plays a major role in identifying the active/passive condition of steel rebars. A literature survey carried out on the threshold limit of chloride to induce rebar corrosion in bridges and concrete structures revealed that various factors in the design stage itself as well as during prolonged exposure influence the quantity of chloride required to destroy passivity and induce rebar corrosion.

The following are the main factors influencing the threshold value of chloride in the design stage itself:

a. Type of cement
b. Quantity of cement
c. Source/Quality of aggregate
d. Admixtures (if any)
e. Proper Mix Design
f. Diffusion coefficient of Chloride
g. Curing Period & Type of curing
h. Concrete Cover Thickness
i. Porosity / voids in the concrete
j. Compaction of concrete
k. Water Quality & W/C ratio
l. Degree of Compaction of Concrete
m. Environmental Condition/ Exposure

Even though a high level of alkalinity remains around the steel embedded in concrete, the chloride ions can locally depassivate the steel and promote rebar corrosion. Depending upon the environment the threshold limit will vary, if the chloride content exceeds the threshold value, suitable preventive measures may be implemented to enhance the service life of RC structures.

## 7.10 Service Life Prediction Models

### 7.10.1 Bazant's model

Bazant proposed a Prediction Models have been established to foresee and evaluate basic service life in view of material resistance and external loads because of aggressive environment. The service life of a structure is characterized as the time of time after establishment until such time when expensive repair gets to be essential. For RC structures in marine situations, the resistance of concrete to chloride actuated degradation to a great extent controls its long haul strength execution. Concrete weakening because of chloride-induced deterioration can be explained to by a basic service life model comprising of an initiation (start) stage and propagation (spread stage) demonstrated in Fig.J. The initiation stage is the time from starting introduction

until depassivation of steel in concrete. This is to a great extent subject to the rate at which chlorides enter into cover concrete. The propagation stage is the time from the onset of steel corrosion until a noticeable splitting of cover concrete or first spalling. Many engineers and researcher have related service life of RC structures basically with the initiation stage, to keep up auxiliary security and serviceability, worthy appearance, and without needing to bring about unforeseen high expenses for repair. The critical time $t_{cr}$, the time at which concrete cover spalls because of corrosion & is assumed to be the sum of depassivation time ($t_p$) and propagation period or corrosion period ($t_{cor}$). The most critical degradation component of these structures is chloride affected reinforcement corrosion, which eventually prompts loss of mechanical properties of the structure.

A conceptual model for service life prediction of corroded RC structures is developed by Tuutti (Fig.J). According to this model, there are two distinct periods in deterioration caused by corrosion. The first is the corrosion initiation and second is the propagation period.

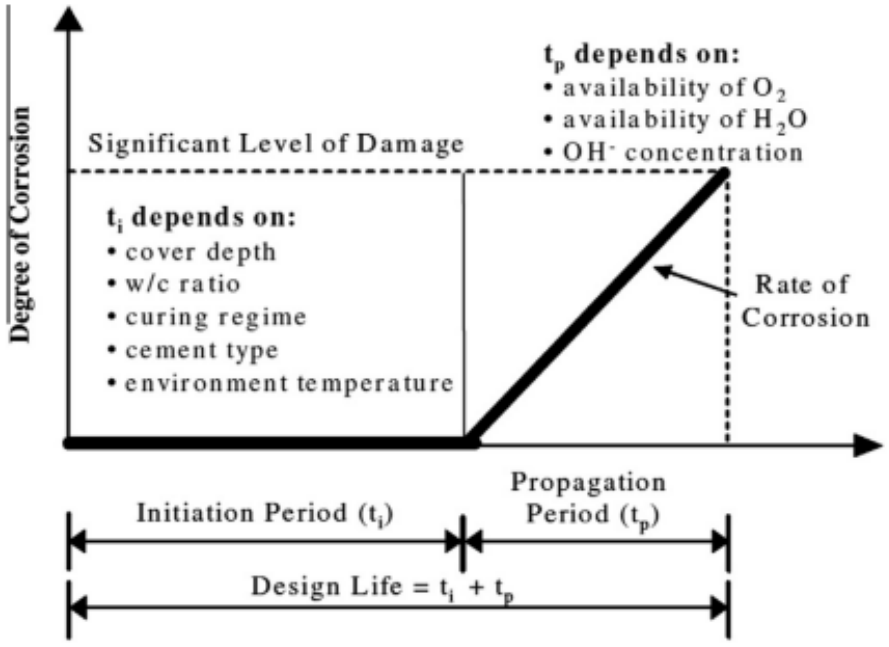



**Fig J. Service life model of corroded structures (Tuutti, 1982)**

Bazant et al. proposed a numerical model for reinforcement corrosion in concrete, to assess the time to corrosion that may lead to splitting of cover concrete. The damage because of corrosion considers the volume of expansion because of the arrangement of hydrated rust over the remaining rebar center. This red rust is expansive in nature and involves four times the volume of parental steel. Subsequently a uniform spiral weight is applied on to the encompassing concrete bringing about outward radial pressure exerted on concrete. This radial pressure is same as the increment in distance across DD of the rebar, and increments with an increase in the volume of rust till the spread solid (cover concrete) splits. As per Bazant's model, the time to cover cracking is a component of corrosion rate (Eqn.2), spread profundity, separating (spacing) or perimeter of the rebar and these are the most significant parameters.

$$t_{cor} = \rho_{cor} \frac{D\Delta D}{pj_r}$$ Eqn.2

Here, $t_{cor}$ -steady state corrosion or propagation period (years).

$\rho_{cor}$ - combined density factor for steel and rust-3600 kg/m3 .

D -Diameter of rebar (mm).

$\Delta D$ - increase in diameter of rebar due to rust formation (cm).

P - Perimeter of bar (mm).

$j_r$ - instantaneous corrosion rate of rust (g/m2 -s)

$$j_r = \frac{W}{F} i_{corr}$$ Eqn.3

Where W - Equivalent weight of steel (rust) = 27.925.

F - Faradays constant = 96,847C.

$i_{cor}$ $_r$- Corrosion current density (lA/cm2

The critical time $t_{cr}$ at which corrosion would produce cracks through the whole cover is given by Eq. 4

$$t_{cr} = t_p + t_{cor}$$ Eqn.4

Where $t_p$ - the time of depassivation (years).

$t_{cor}$ - steady-state corrosion period (years).

The passivation time (Bazant et al.) which may be calculated Eqn.5 from diffusion of chloride ions and $t_{cr}$ is calculated from Eqn.4

$$t_p = \frac{1}{12D_{app}}\left(\frac{L}{1-\sqrt{\frac{C_{th}}{C_s}}}\right)^2 \qquad \text{Eqn.5}$$

Where L - cover thickness (mm).

$C_{th}$ - the threshold value of the chloride concentration (kg/m3 of concrete).

$C_s$ - the concentration of chloride ions in pores of concrete at the surface ($Kg/m^3$ of concrete).

$D_{app}$- apparent chloride diffusion coefficient (cm2 /s).

The same formulation is adopted to calculate the depassivation time and critical time of cracking for the other models to predict the service life

### 7.10.2 Morinaga's Model

Morinaga suggested a simplified mathematical model to register the measure of corrosion ($Q_{cr}$) of steel in cement, when concrete cover breaks because of expansion of rust development on the surface of the rebar. The damage due to corrosion considers the volume of expansion because of the development of hydrated rust over the left over rebar center. Corrosion rate is the most noteworthy parameter in deciding the time to cracking of the spread concrete. The time from start of corrosion to cover cracking is a component of corrosion rate, solid clear cover, and steel bar distance across (Morinaga, 1988). It is apparent that the experimental mathematical statement does not represent the mechanical properties of concrete which would altogether influence the time to cover cracking. Refer Eqn.6.

$$Q_{cr} = 0.602D\left(1+\frac{2C_V}{D}\right)^{0.85} \qquad \text{Eqn.6}$$

Where, $Q_{cr}$ - amount of corrosion when concrete cracks ($10^{-4}$ g/cm$^2$).

$C_v$ - concrete cover thickness (mm).

D - diameter of rebar (mm).

The duration of steady state corrosion, $t_{cor}$ corresponding to $Q_{cr}$ can be obtained as:

$$t_{cor} = \frac{Q_{cr}}{j_r}$$

Eqn.7

Where, Jr - instantaneous corrosion rate (g/m$^2$ -s)

### 7.10.3 Wang and Zhao's Model

Wang and Zhao have recommended a stage technique for utilizing limited component examination to focus the thickness of the corrosion product, D, comparing to the time term when the surface concrete cracks. Further by breaking down an extensive number of rebar corrosion information gathered from research facility and contrasting them and the aftereffects of limited component examination, the researchers established an exact expression to focus the proportion of thickness of corrosion product, D, to the penetration depth of the rebar H, comparing to the crack in spread concrete. The ratio (D/H) Eqn.8, has been communicated as a component of concrete cube strength fcu, as:

$$\frac{\Delta}{H} = 0.33\left(\frac{D}{C_V}\right)^{0.565} f_{cu}^{1.436}$$

Eqn.8

Where, D-diameter of reinforcing bar (mm).

Cv- Cover thickness (mm).

fcu- Cube strength of concrete (kN/cm2 ).

D- Thickness of corrosion product (cm).

H- Cracks in concrete cover.

Using the value of D obtained, the estimation of H relating to cracks in cover concrete can be obtained. Further the estimation of H can be utilized to focus the time essential for longitudinal cracking of cover concrete, $t_{cor}$

$$t_{cor} = \frac{H}{p_r}$$

Eqn.9

where $p_r$ - penetration rate of rebar due to corrosion can be calculated from

$$p_r = \frac{W}{F\rho_{st}} i_{corr}$$

Eqn.10

Where $W$ -equivalent weight of steel = 27.925

F -Faraday's constant = 96,847C

$i_{corr}$ -Corrosion current density ($\mu A/cm^2$)

$\rho_{st}$ -Density of steel ($kg/m^3$)

### 7.10.4 IV- IRC Model

Corrosion propagation time is being evaluated due to falling pH (IRC). The reason for the falling pH is by process of carbonation, or as a consequence of chloride substance transcending the limit near to the reinforcement. Some guiding expressions are available in the IRC-SP60 to determine the propagation time. If there should arise an occurrence of generalized corrosion, the basic loss of bar span is in view of the cover cracking. The propagation (cracking) time can be inexact by the accompanying formula, Eqn.11

$$t_r = \frac{80C}{Dr}$$

Eqn.11

Where, C -the thickness of the concrete cover (mm).

D -the diameter of the reinforcing bar (mm).

r -rate of corrosion (µm/year).

$t_r$ -steady-state corrosion (years).

The rate of corrosion in concrete can be evaluated using the Eqn.12

$$r = c_T r_O$$ Eqn.12

Where $c_T$ -the temperature coefficient.

$r_O$ -the rate of corrosion at +20 C

Because of exposure to the salt water in the coastal regions, concrete bridges are contaminated with chlorides. The presence of chlorides (resulting in the loss of alkaline environment), oxygen and water lead to corrosion of embedded steel. Chloride ions diffuse through the porous concrete and reach the corrosion threshold value. The resultant cracking of concrete cover allows intrusion of chlorides and oxygen at a much faster rate, thus accelerating the corrosion process. Existing chloride in concrete is not considered in the following expression. As a result of chloride penetration a gradient is set up near the concrete surface. The time at which the critical chloride content reaches the steel surface and de-passivates it, is regarded as the initiation time of corrosion.

### 7.10.5 Carslaw and Jaeger Model

The closed-loop solutions provided by Carslaw and Jaeger (1947) for the Eq. (1) (for various boundary conditions) have been commonly adopted for predicting chloride migration in concrete, with a set of assumptions.

- Concrete is a semi-infinite, porous, homogeneous and isotropic material.
- No reactions thought to occur between the concrete and diffusing species (chlorides).
- C(x, t) = 0 when t = 0 and x > 0
- C(x, t) = f(t) when x = 0 and t > 0 Carslaw and Jaeger (1947) have provided solutions for three different boundary conditions. For example, when surface chloride concentration is constant, i.e., f(t) = C0, the solution is,

$$C(x,t) = C_i + (C_s - C_i) \cdot erfc\left(x/\sqrt{4Dt}\right)$$ Eqn.13

Where, C(x, t) - chloride concentration at depth x after exposure time t,

Ci - initial chloride concentration at depth x (t = 0),

Cs - constant surface chloride concentration (at any given time),

erfc - complementary error function.

The solutions for two other boundary conditions (i.e., f(t) = k· t and f(t) = k·√t, where k is a constant), along with the equations for Life-365 Model

Fig. K indicates the effect of concrete cover and diffusion coefficient of chloride and chloride content on corrosion initiation time.

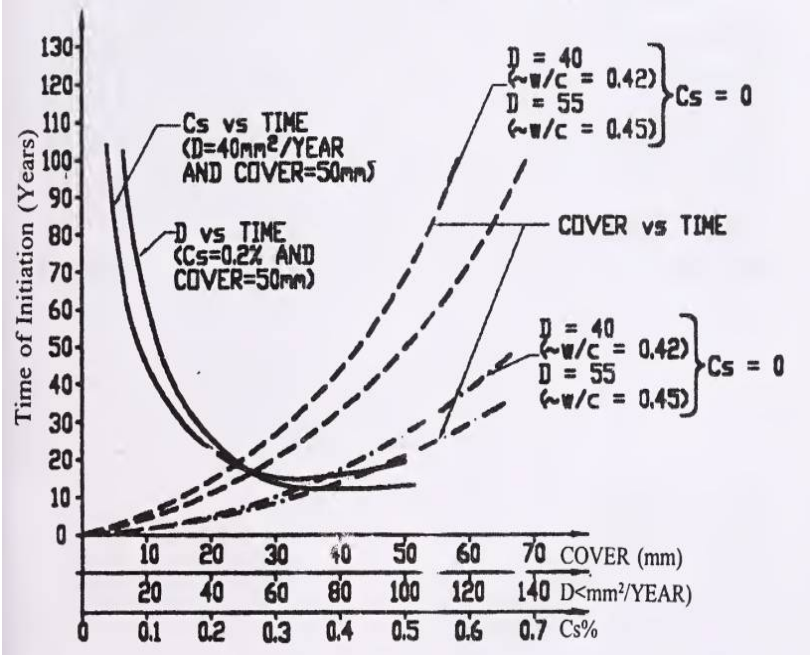



**Fig. K Effect of Cover & Diffusion coefficient on Corrosion initiation**

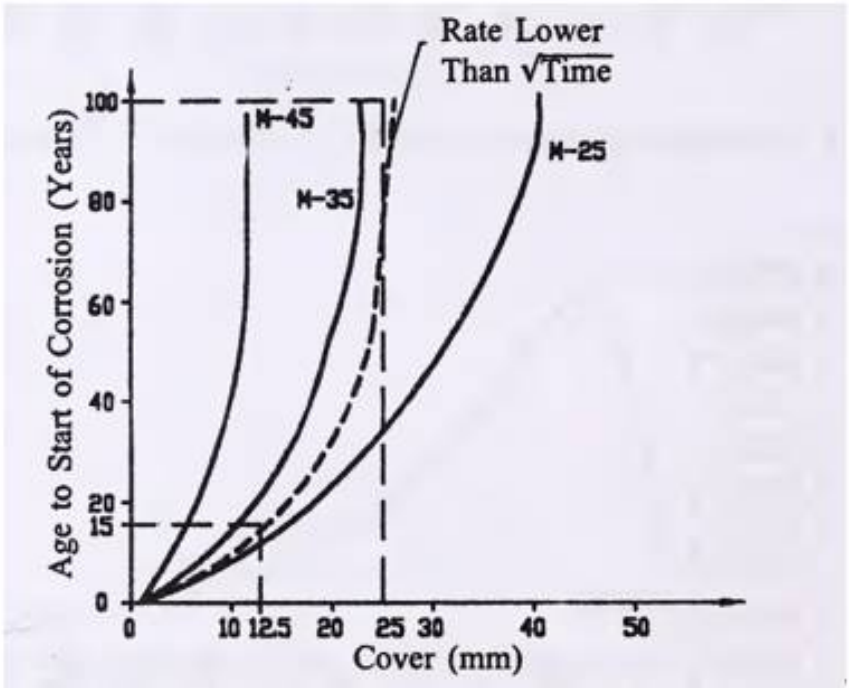



**Fig. L Effect of Cover on Corrosion initiation by carbonisation**

Fig.L indicating the age to start corrosion due to carbonation in various grades of concrete. Yet another study 7 observes that carbonation and chlorides can penetrate to the interior of concrete at a lower rate than would be given by a square-root of time function. This means that if the concrete cover is halved, the critical state for incipient danger of corrosion will be reached in less than a quarter of the time.

**We have adopted IRC Model in evaluating the corrosion periods.**

## Extending Life of structure with Regular Maintenance & Repair

There are various factors contributing for durability of structure and degradation of structure.

Corrosion of reinforcing steel and other embedded metals is the leading cause of deterioration in concrete. When steel corrodes, the resulting rust occupies a greater volume than the steel. This expansion creates tensile stresses in the concrete, which can eventually cause cracking, delamination, and spalling. Steel corrodes because it is not a naturally occurring material. Rather, iron ore is smelted and refined to produce steel. The production steps that transform iron ore into steel add energy to the metal. Steel, like most metals except gold and platinum, is thermodynamically unstable under normal atmospheric conditions and will release energy and revert back to its natural state—iron oxide, or rust. This process is called corrosion.

Fig.M represents the acceptable performance level of the RC building and if the performance level falls below the acceptance level, it shall be repaired / restored to its original strength. The extension of service life of structure depends on the method of repair /strengthening method adopted. Fig.N depicts the first repairs/ strengthening applied when the performance of building reaches non acceptable level due to degradation concrete and extended service life of the Building. T1 is the age building from the construction and R1 is the First repair done in view of performance reaching non acceptable level, the service life of the structures extended from L1 to L2. The repairs can be applied with proper condition evaluation of the existing building and carrying out the analysis and design of the building with degradation impact.

Repair methods can be applied as proposed by the consultants. The extended service life of the building depends on work done on strengthening methods and regular maintenance of the building after strengthening.

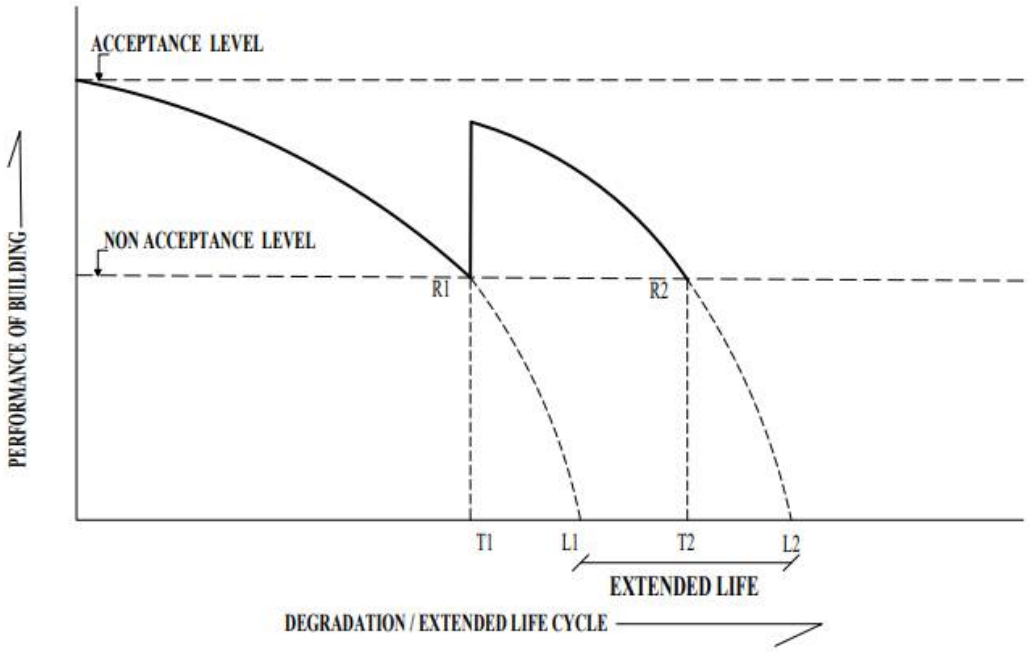



**Fig.M Extended service life with repair/strengthening**

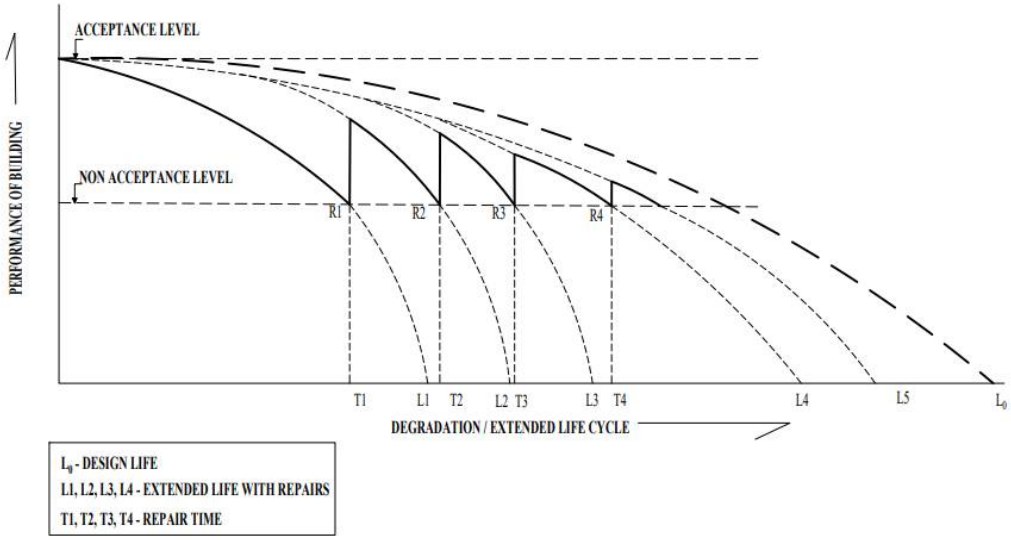



**Fig.N Extended service life with repair/strengthening, poor maintenance and `multiple repairs**

It was reported that, Tower C was built in year 2017-18, distress in the building with cracks and spalling of concrete observed with in the 5 yrs age of structure. The corrosion initiation may have occurs in the first 2 to 3 Yrs and propagation of corrosion have taken place in 3 to 5 yrs, resulted in the de-colouring of concrete along the reinforcement, Cracking of concrete and Spalling of concrete.

The main causes of distress in the various Structural Elements of Tower C are due to

1. Lesser Cover for Structural elements
2. Appropriate Exposure Condition is not considered in the design
3. Actual compressive strength of concrete in the structural elements are less than the design strength of concrete,
4. Use bore water for curing with chloride contaminated water for curing (information given by RWA)
5. Poor Quality Control
6. Concrete Pour Card Not available, issue with strength of concrete poured
7. Quick action against degradation (strengthening) measures is not done

**Table D. Depicts the cover provided for the various structural elements**

| Structural Component | Cover in GFC | Cover as Per IS code 456 | Status | Remarks |
|---|---|---|---|---|
| Piles | 75mm | 75mm | Okay | Severe Exposure Condition , Table 16, IS 456 |
| Pile Cap | 75mm | 75mm | Okay | |
| Columns & Shear Wall | 35mm | 45mm | Not Okay | |
| Beams | 30 | 45 | Not Okay | |
| Slabs | 30 | 45 | Not Okay | |
| Staircase Waist Slab | 30 | 45 | Not Okay | |

**Table E Extended service life with proposed strengthening of distress elements - Tower C**

| Tower C | Year | Age | Remarks |
|---|---|---|---|
| Design Life | 50 Yrs | 50 yrs | As per Euro Code 01- CEN 1994, IRC SP60 |
| Constructed Date | 2014 | 0 | |
| Age at Visible Cracks | 2021 | 4.5 | As per the information gathered from RWA |
| Continued Distress | 2023 | 3 | After Visible Cracks |
| Application of Strengthening of Distress members | 2023-24 | 1yrs | |
| Extended Service Life | | 28 -30yrs | With proposed strengthening & regular maintenance, further degradation shall be reduced. Repairs shall be applied at time, when the performance level will fall below the Non-acceptance level. The original service life of the structure cannot be obtained. |
| Current Service life without strengthening | | 8- 10 yrs | The building is in aggressive environment, the present distress level will increase in view of increase in corrosion of rebars with age of structure. Without any strengthening, with increase degradation (strength of concrete and rebar) the structural capacity of the member reduces. Failure of any one structural element/multiple element will lead to progressive collapse of the building |
| Repetition of strengthening | | Yes | The building is in aggressive environment, periodic maintenance and strengthening will be required |

## Important Note & Caution

Extended Service life of Tower-C depends on the following, However, BV do not have any binding/ responsibility on quality of restoration work to be carried out on the structure:

1. The assumption made in the reduction of diameter of the Main bar is based on the corroded bars exposed and the actual compressive strength of the concrete in all the structural element shall be M25 in view of degradation and NDT results.
2. *The IS code prevailing during construction of the building Tower C are used in evaluation, IS 1893-2002 & IS 13920 -1993 are used together with other relevant codes*
3. The Strengthening Methodology proposed shall be strictly followed & no deviation

4. All Strengthening work shall be executed by experienced and skilled retrofitting consultants/contractors.
5. All the Strengthening work shall be monitored and quality assurance shall be established by a technically competent and experienced consultants in strengthening of RC degraded structures due to corrosion of rebars.
6. All Strengthening sequence shall be approved by the Structural consultant.

## 8.0 INFERENCES.

Following are the inferences drawn, based on the detailed observations and results of probing tests.

8.1 From the results of Ultrasonic pulse velocity test, it is inferred that the quality of concrete in the tested Common Basement floor RC members & RC members of Tower-C fall under the category of "**Doubtful to Good concrete".**

8.2 From the results of Rebound Hammer test, it is inferred that the estimated strength of concrete nearer to surface /surface hardness of tested Common Basement floor RC members & RC members of Tower-C is found to be **satisfactory**.

8.3 From the observations of extracted concrete core samples, it is evident that the extracted samples are uniform, homogeneous and free from voids/honeycombs. From the concrete core test results, it is indicated that the quality/strength of concrete in the tested Common Basement floor RC members & RC members of Tower-C is found to be **satisfactory.**

8.4 From the results of the Half-Cell Potential Measurement Test, it is inferred that the probability of corrosion fall in the category "**Uncertainty of Corrosion to High Probability of corrosion" i.e., Moderate to Advance stage of corrosion** in the tested Common Basement floor RC members & RC members of Tower-C.

8.5 From the results of the carbonation test, it is inferred that the **carbonation front has reached up to reinforcement level** from the surface in most of the tested Common Basement floor RC members & RC members of Tower-C.

8.6 From the results of the Chloride content test, it is inferred that the level of chloride content in the tested concrete samples of Common Basement floor RC members & RC members of Tower-C is **beyond the permissible limit** of 0.6 kg/cum in some RC members and within the limits in some RC members.

8.7 From the results of the Sulphate content test, it is inferred that the level of sulphate content in the tested concrete samples of Common Basement floor RC members & RC members of Tower-C is **within the permissible limit** of 4%.

8.8 From the results of pH value, it is evident that the pH value is found to be **with-in the desired value** in most of the tested concrete samples of Common Basement floor RC members & RC members of Tower-C is in the desired range.

8.9 From the results of the water test, it is evident that the water below the grade slab/flooring does not confirms to requirements of IS 456: 2000 for plain/ reinforced concrete construction.

8.10 Cracks, spalling of concrete and exposure of rebar are essentially due to corrosion of embedded rebars. The reasons for corrosion in RC members may be due any one or combination of reasons listed below.

- **Very less cover provided for RC members.**

  As per clause 8.2.2.1 (Environmental Exposure Condition) and 26.4.2 (Nominal Cover to Meet Durability Requirement) of IS 456: 2000 minimum cover to be maintained in **"Severe"** (Coastal Environmental Exposure Condition) is 45mm.

- **Presence of inbuilt high chloride content in concrete due to**

1. Use of high chloride content water during construction i.e. Mixing and as well as curing.
2. Use of adulterated aggregates

- **Ingress of moisture into RC members.**

  This is due to leakage of water from roof slabs, seepage from retaining walls, stagnation of water and inadequate slope in RC members.

- **Carbonation of concrete.**

  Considering the age of the concrete the depth of carbonation in the affected members is more than expected.

8.11 Repairs carried for distress regions of RC members to arrest corrosion were observed to be executed without providing shear connector, mechanical anchors and weld mesh which may lead to de-bonding of concrete/cracks over a prolonged period. This needs appropriate corrective action to enhance the durability and serviceability of the structure.

8.12 Corrosion of rebars in RC members at expansion joint region & Pipe duct region is essentially due to continuous leakage of water & inadequate thickness of cover concrete.

8.13 Seepage of water in/through the retaining wall is essentially due to very high water table in the vicinity of the apartment/area.

8.14 Seepage/Leakage & damp patches in peripheral retaining walls on the basement floor are essentially due to in-effective waterproof treatment on exterior side or positive side and at the junctions of the wall/the construction joint regions of the wall. Added to it, ineffective surface drainage system at the ground level leading to ingress/seepage of water into the basement through retaining walls.

8.15 The drainages at podium level are having undulations/reverse slope leading to stagnation and seepage of water. **Note:** No records were available regarding the treatment carried out on the exterior face of the retaining wall.

a) Stagnation of water over roof slab is essentially due to improper/inadequate slope provided

for disposal of rainwater.

b) Cracks in pavement concrete is due non provision of groove for thermal expansion.

c) Dampness/damp patches and peeling of paint in the basement ceiling slab is essentially due to leakage of water.

8.16 Based on analysis with and without distress of structural elements as detailed in theoretical analysis and design shear wall S1 to S36 requires strengthening, on the other hand columns, beams and slabs with degradation found to be adequate to withstand the expected loads. The strengthening of columns, beams and slabs is required in view of corrosion of rebars and strength of concrete less than designed strength. The minimum grade of concrete for strengthening of structural elements shall be M40.

8.17 Based on IRC model Service life of the structure is evaluated with degradation due to corrosion rebars and expected extended service life of structure with strengthening of distressed members are furnished.

## 9.0 RESTORATION/CORRECTIVE MEASURES.

Based on the above detailed studies & inferences drawn, appropriate recommendations are made

### 9.1 Providing concrete encasement for severely corrosion distressed RC Columns.

**Sequence of operations:**

a. Temporary support shall be provided to adjoining beams/slab around the column at a distance of 1.0 m from the column face using appropriate props for effective transfer of load.

b. Infilled walls if any, on either side of the column of about 500 to 750 mm shall be completely removed for the entire height from top to bottom

c. The existing plaster and loose cover concrete in columns shall be removed thoroughly by gentle chipping and cleaned with a wire brush and water jet.

d. The exposed reinforcement shall be cleaned thoroughly using a mechanical wire brush/ buffing wheel followed by a water jet to remove corrosion scales.

e. Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.

f. Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.

g. Exposed concrete surface shall be provided with corrosion inhibitor solution using a

pneumatic sprayer as per manufacturer's specification.

h. The cleaned surface of the exposed reinforcement shall be provided with two coats of anti-corrosive chemical as per the manufacturer's specification.

i. 16 mm dia, 100 mm deep holes shall be drilled at 300 mm c/c (staggered) for fixing shear connectors and the drilled holes shall be thoroughly cleaned to remove dust particles using air and water jet.

j. 12 mm dia shear connectors shall be fixed in drilled holes using polyester resin anchor grout as per manufacturer's specification.

k. Appropriate dia holes shall be drilled in the beam/slab/grade-slab to insert proposed column bars.

l. 10mm dia holes shall be drilled in the RC wall to insert ties @ 200c/c (if applicable).

m. Proposed rebars column bars (with two coats of anti-corrosive chemical coating) shall be fabricated, placed in position and tack welded to shear connectors as detailed in sketch.

n. 8 or 10mm dia ties @ 200c/c shall be provided or fixed in drilled holes using anchor grout as per standard practice (if applicable).

o. 100/75 mm dia through holes shall be made in RC slab at column junctions to facilitate pouring free flow micro concrete.

p. Specified thick (as per schedule), non-shrink, free flow, self-compacting concrete encasement shall be provided using slurry tight shuttering as per specification enclosed.

q. The encased concrete shall be cured for a minimum period of 7 days as per standard practice.

**(Refer sketch DWG.REF. No.RM-01, 02, 17, 18)**

## 9.2 Providing concrete encasement for severely corrosion distressed RC Beams.

**Sequence of operations:**

a. Temporary support shall be provided to adjoining slab around the beam using appropriate props for effective transfer of load.

b. The existing plaster and loose concrete in beams shall be thoroughly removed by gentle chipping and cleaned using a mechanical wire brush and water jet.

c. The exposed reinforcement shall be cleaned thoroughly using the mechanical wire brush/ buffing wheel followed by a water jet to remove corrosion scales, loose particles, etc.

d. Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.

e. Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.

f. Exposed concrete surface shall be provided with corrosion inhibitor solution using a pneumatic sprayer as per manufacturer's specification.

g. The cleaned surface of the exposed reinforcement shall be provided with two coats of anti-corrosive chemical as per the manufacturer's specification.

h. 10 or 12 dia holes shall be drilled in the slab/beam to insert 8mm stirrups at 200c/c on both sides of beam exactly parallel to each other. Drilling depth shall be 100mm if stirrups needs to terminated with in the slab, through and through if the stirrups to be terminated on top of slab/beam, drilling not required if stirrups to be terminated outside/underneath the slab and held using shear connectors.

i. if the stirrups to be terminated on top of slab, about 50mm of slab concrete to removed by gentle chipping without damaging the surroundings.

j. Proposed dia, 100 mm deep holes shall be drilled at specified intervals (staggered) for fixing shear connectors and the drilled holes shall be thoroughly cleaned to remove dust particles using air and water jet.

k. Proposed dia shear connectors shall be fixed in drilled holes using polyester resin anchor grout as per manufacturer's specification.

l. Appropriate dia holes shall be drilled in the column/beam to insert proposed rebars.

m. Proposed rebars rebars bars (with two coats of anti-corrosive chemical coating) shall be fabricated, placed in position and tack welded to shear connectors as detailed in sketch.

n. 8mm dia stirrups @ 200c/c shall be provided to suit the site condition.

o. 100/75 mm dia through holes shall be made in RC slab staggered on both sides of beam to facilitate pour concrete.

p. 75mm thick, non-shrink, free flow, self-compacting concrete encasement shall be provided using slurry tight shuttering as per specification enclosed.

q. The encased concrete shall be cured for a minimum period of 7 days as per standard practice.

**(Refer sketch DWG.REF. No.RM-03A, 03B, 03C)**

### 9.3 Treatment for peripheral RC retaining wall of Basement floor to prevent seepage of water.

a. All existing plaster/de-bonded cover concrete shall be completely removed by gentle chipping to expose hard / sound concrete.
b. 'U' groove of 10 mm shall be made along the lift interface/ crack/construction joint. and filled with polymer modified mortar.
c. 12 mm dia holes, 75 mm deep @500c/c shall be drilled along the crack/joint/ honey-combed/damped surface to fix PVC nozzles for grouting.
d. 10 mm dia PVC nozzles shall be fixed into the drilled holes using anchor grout as per specification.
e. 'U' groove shall be filled with polymer modified mortar as per standard practice.
f. Pressure grouting shall be done with a pressure of 3 to 4 Kg/sq.cm using low viscous, elastic and solvent-free polyurethane injection resin grouting through the nozzles as per specification enclosed. The nozzles shall be cut in flush with the surface and plugged.

**(Refer sketch DWG.REF. No.RM-04)**

**Note:**

The above treatment is shall be carried out from the negative side. Since the observed distress such as dampness, damp patches &seepage in retaining walls are minor, it is recommended to carry out the grouting from the negative side & wait for two seasons.

If the problem still persists then, treatment shall be carried from the positive side (Since the cost implication is high in treating from positive side, it has been kept as the secondary option) as detailed below.

**OPTIONAL**

**Treatment for peripheral RC retaining wall to prevent seepage of water from positive side.**

a. Existing landscaping/paver blocks/PCC/earth filling shall be removed completely without damaging the parent concrete of retaining wall to expose the distressed/damped portion of the retaining wall.
b. The exposed concrete surface shall be inspected and checked for any surface honeycombs, cracks/distress if any.
c. The existing cracks & honeycombs in the retaining wall (if any) shall be grouted using low viscous, elastic and solvent-free polyurethane injection resin as per manufacture's specification.

d. The entire concrete surface shall be providing with water proofing plaster mixed with silica fumes and polypropylene fibers.
e. 4 mm thick APP membrane shall be provided on the plastered surface with adequate torching as per manufacturer's specification.
f. Backfilling shall be carried using approved quality soil in layers to 95% degree of compaction.
g. 100mm thick screed concrete shall be provided over 100mm thick soling with adequate slope to drain off water and avoid water entering the treated regions.

**9.4 Providing concrete encasement for severely corrosion distressed RC shear walls.**

**Sequence of operations:**

a. Temporary support shall be provided to adjoining beams/slab around the column at a distance of 1.0 m from the column face using appropriate props for effective transfer of load.
b. The existing plaster and loose cover concrete in shear wall shall be removed thoroughly by gentle chipping and cleaned with a wire brush and water jet.
c. Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.
d. The exposed reinforcement shall be cleaned thoroughly using a mechanical wire brush/ buffing wheel followed by a water jet to remove corrosion scales.
e. Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.
f. Exposed concrete surface shall be provided with corrosion inhibitor solution using a pneumatic sprayer as per manufacturer's specification.
g. The cleaned surface of the exposed reinforcement shall be provided with two coats of anti-corrosive chemical as per the manufacturer's specification.
h. Appropriate dia, 100 mm deep holes shall be drilled at specified intervals (staggered) for fixing shear connectors and the drilled holes shall be thoroughly cleaned to remove dust particles using
air and water jet.
i. proposed dia shear connectors shall be fixed in drilled holes using polyester resin anchor grout as per manufacturer's specification.
j. Appropriate dia holes shall be drilled in the beam/slab/grade-slab to insert proposed

column bars.

k. Proposed rebars vertical and horizontal (with two coats of anti-corrosive chemical coating) shall be fabricated, placed in position and tack welded to shear connectors as detailed in sketch.

l. 100/75 mm dia through holes shall be made in RC slab at column junctions to facilitate pouring non-shrink, free flow, self-compacting concrete.

m. 50mm thick, non-shrink, free flow, self-compacting concrete encasement shall be provided using slurry tight shuttering as per specification enclosed.

n. The encased concrete shall be cured for a minimum period of 7 days as per standard practice.

**(Refer sketch DWG.REF. No.RM-16)**

## 9.5 Treatment for moderately distressed regions of RC members (Locally damaged areas).

a. All loose plaster, cover concrete & patch-up regions in the RC members shall be completely removed by gentle chipping to expose hard / sound concrete surface.

b. Exposed reinforcing bars shall be thoroughly cleaned with wire brush and emery cloth or by mechanical buffing wheel to remove rust, scales etc.

c. Exposed concrete surface shall be thoroughly cleaned with wire brush followed by air and water jet to remove dust particles.

d. Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.

e. Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.

f. Two coats of anti-corrosive chemical shall be provided on the exposed and cleaned reinforcing bars as per the manufacturer's specification.

g. Exposed concrete surface shall be provided with corrosion inhibitor solution using a pneumatic sprayer as per manufacturer's specification.

j. 20 mm thick polymer modified mortar plaster to specification shall be provided (suitable to site condition) and finished in flush with the adjacent surface over a coat of primer as per manufacturer's specification and cured.

**(Refer sketch DWG.REF. No.RM-05)**

***Note:***

*a) If the thickness of structural grade polymer/latex modified mortar layer exceeds 20mm, a layer of weld mesh 50 x 50 x 3 mm shall be placed and fixed to concrete using U nails.*

*b) It is advisable to apply corrosive inhibitor solution to the entire external surface of RC members which are affected. The measures recommended in order to avoid ingress of moisture during rains, since the chloride in concrete will be active in the presence of moisture environment.*

c) *During any maintenance, it is recommended to use moisture resistant paints to RC members.*

**9.6 Treatment for distressed regions of RC slab/waist slab of staircase/Landing Beam**

a. All loose plaster, cover concrete & patch-up regions in the RC members shall be completely removed by gentle chipping to expose hard / sound concrete surface.
b. Exposed reinforcing bars shall be thoroughly cleaned with wire brush and emery cloth or by mechanical buffing wheel to remove rust, scales etc.
c. Exposed concrete surface shall be thoroughly cleaned with wire brush followed by air and water jet to remove dust particles.
d. Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.
e. Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.
f. Two coats of anti-corrosive chemical shall be provided on the exposed and cleaned reinforcing bars as per the manufacturer's specification.
g. Exposed concrete surface shall be provided with corrosion inhibitor solution using a pneumatic sprayer as per manufacturer's specification
h. Appropriate dia, 75/100 mm deep holes shall be drilled at specified intervals (staggered) for fixing shear connectors and the drilled holes shall be thoroughly cleaned to remove dust particles using air and water jet.
i. Proposed dia shear connectors shall be fixed in drilled holes using polyester resin anchor grout as per manufacturer's specification.
j. a layer of weld mesh 50 x 50 x 3 mm shall be placed and fixed to concrete using shear connectors.

k. 40 mm thick shotcrete (30mm main coat and 10mm polish coat) to specification shall be provided (suitable to site condition) and finished in flush with the adjacent surface as per standard practice and cured.

**(Refer sketch DWG.REF. No.RM-11, 10, 14 )**

**9.7 Treatment for cracks in RC Ceiling slab.**

a. All existing plaster/de-bonded cover concrete shall be completely removed by gentle chipping to expose hard / sound concrete.

b. 'U' groove of 10 mm shall be made along the lift interface/ crack/construction joint. and filled with polymer modified mortar.

c. 12 mm dia holes, 50/75 mm deep @ 200mm c/c shall be drilled along the crack/joint/ honey-combed surface to fix PVC nozzles for grouting.

d. 10 mm dia PVC nozzles shall be fixed into the drilled holes using anchor grout as per specification.

e. 'U' groove shall be filled with polymer modified mortar/ epoxy putty as per standard practice.

f. Pressure grouting shall be done with a pressure of 3 to 4 Kg/sq.cm using low-viscosity epoxy injection grouting through the nozzles as per specification enclosed. The nozzles shall be cut in flush with the surface and plugged.

**(Refer sketch DWG.REF. No.RM-07, 08)**

**9.8 Treatment for separation crack between the junction of RC member & masonry wall.**

**a.** ' U' groove of 12 mm wide 6 mm deep shall be made all along the crack at the interface of masonry wall and RC member junction and cleaned.

b. Groove shall be filled with a flexible sealant like Tacksel/Polysulphuide sealant /silicon sealant or any other equivalent.

**(Refer sketch DWG.REF. No.RM-06)**

**9.9. Treatment for cracks in Masonry wall.**

a. Existing plaster along the crack shall be removed on either side of the crack for a width of about 300 mm (on either side of the wall) and cleaned.

b. Mortar joints along the crack shall be deep raked and filled with cement mortar.

c. Weld-mesh of size 50 x 50 x 3 mm shall be fabricated and fixed across the crack using 'U' nails.

d. Re-plastering the region with CM 1:4 as per standard practice

**(Refer sketch DWG.REF. No.RM-12)**

### 9.10 Treatment for dampness region of masonry wall.

a. The deteriorated plaster on masonry walls shall be removed by gentle chipping.

b. The mortar joints in walls shall be deep racked and re-pointed with CM 1:4 as per the standard practice followed by re-plastering in CM 1:3 mixed with waterproofing plasticizers.

### 9.11 Treatment for chejja's.

a) The deteriorated plaster on top and bottom chejja shall be removed by gentle chipping.

b) The chejja shall be cleaned using air and water jet as per standard practice.

c) Exposed reinforcing bars shall be thoroughly cleaned with wire brush and emery cloth or by mechanical buffing wheel to remove rust, scales etc.

d) Exposed concrete surface shall be thoroughly cleaned with wire brush followed by air and water jet to remove dust particles.

e). Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.

f). Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.

g). Two coats of anti-corrosive chemical shall be provided on the exposed and cleaned reinforcing bars as per the manufacturer's specification.

g). Exposed concrete surface shall be provided with corrosion inhibitor solution using a pneumatic sprayer as per manufacturer's specification.

h). 20mm thick screed concrete shall be provided to slope over the chejja top,

i). 12mm thick( 1:4) mixed with polypropylene fibres and water proofing compound shall be provided as per standard practice.

k). 20 mm thick polymer modified mortar plaster to specification shall be provided (suitable to site condition) and finished in flush with the adjacent , with a drip mould at the edge and cured.

**(Refer sketch DWG.REF. No.RM-13)**

### 9.12 Treatment for floor slabs.

a) All loose plaster, cover concrete & patch-up regions in the RC members shall be completely removed by gentle chipping to expose hard / sound concrete surface.

b) Exposed reinforcing bars shall be thoroughly cleaned with wire brush and emery cloth or by mechanical buffing wheel to remove rust, scales etc.

c) Exposed concrete surface shall be thoroughly cleaned with wire brush followed by air and water jet to remove dust particles.

d) Sacrificial zinc anode shall be provided as per standard practice and manufacturers specification.

e) Severely corroded rebars (if any) shall be replaced by same diameter rebar through welding.

f) Two coats of anti-corrosive chemical shall be provided on the exposed and cleaned reinforcing bars as per the manufacturer's specification.

g) Exposed concrete surface shall be provided with corrosion inhibitor solution using a pneumatic sprayer as per manufacturer's specification.

h) a coat of bonding epoxy shall be provided prior to concreting as per standard practice.

i) 20 mm thick screed concrete to specification shall be provided (suitable to site condition) and finished in flush with the adjacent surface over a coat of primer as per manufacturer's specification and cured.

j) Tile/granite/marble flooring to suit the present requirement shall be carried out as per standard

Note : Based on the corrosion condition of the floor slab additionally 8mm bar @ 250c/c may be provided using shear connectors.

**(Refer sketch DWG.REF. No.RM-15)**

### 9.13 Anti-Carbonation treatment to all RC members.

Considering the corrosion environment and presence of high chloride content in RC members it is recommended to provide anti-carbonation protective coating all the RC members Tower C to protect RC members from carbonation and to enhance the life of the structure.

(This has to be carried out after completing all proposed restorations measures to RC members)

**9.14 All leaky down take pipes in the shaft/duct region shall be removed and replaced with the new ones by using PVC pipes as per standard practice ensuring leak-proof joints.**

**9.15 Adequate slope shall be provided in bed of existing drains for easy disposal of water and avoid water stagnation.**

**9.16 Groove cutting shall be made/provided in existing pavement concrete to facilitate thermal expansion. The groove shall be filled using elastomeric/water-resistant sealant/bitumen.**

**Note:** *Since the inbuilt/inherent chloride content in the concrete is excess than the permissible limit, the restoration schemes are worked out in order to* ***reduce/ minimize*** *the corrosion by providing concrete encasement to severely distressed members and polymer modified mortar treatment to locally damaged regions. Sacrificial zinc anode has been suggested to enhance the longevity of the structure.*

*Additional protective measures such as anti-carbonation coating has been proposed which acts as barrier against the corrosive environment and protects the concrete to maintain its alkalinity & rebar's from corrosion.*

*To arrest leakages, seepages and to fill cavities/honeycombs in the concrete grouting has been suggested.*

*The above recommended restoration /corrective measures is to render distress regions normal and minimize the extent of distress & to enhance the life/durability of the structure.*

## 10.0 GENERAL RECOMMENDATIONS

In addition to the above-mentioned recommended measures, the following are the general recommendations.

- The joint between ramp wall & paver block road at south face & east face shall be provided with elastomeric / water-resistant sealant/bitumen to avoid water entering adjacent to the wall.
- Corrosion activities shall be monitored in RC members periodically (i.e., at least three years once).
- Leakages/seepages/corrosion in any RC member shall be treated immediately without delay.

- Water stagnation on floor slab/drain shall be avoided.
- Periodic maintenance of the building shall be strictly adhered to for effective functioning and enhancing the life of the structure.
- Stagnation of water around the flowerpots shall be avoided by providing a plastic plate/bowl for collecting excess water.

## 11. CONCLUDING REMARKS

Based on the detailed assessment study carried out on Tower C of the existing **"CHANDERKUNJ" Army Towers of Army Welfare Housing Organisation (AWHO) Residential Apartment Building"** located at Silver Sand Island, Vytilla, Kochi, Kerala, India as it stands is found to be distressed mainly due to corrosion, minor leakages and seepages. However, the quality & strength of concrete in the tested RC members are found to be by and large satisfactory.

The extensive distress is mainly due to presence of in built/inherent high chlorides content in the concrete samples, carbonation of concrete, leakages from roof slab, Seepages from retaining wall over a period of time.

Based on analysis with and without distress of structural elements as detailed in theoretical analysis and design shear wall S1 to S36 requires strengthening, on the other hand columns, beams and slabs with degradation found to be adequate to withstand the expected loads. The strengthening of columns, beams and slabs is required in view of corrosion of rebars and strength of concrete less than designed strength. The minimum grade of concrete for strengthening of structural elements shall be M40.

Based on IRC model Service life of the structure is evaluated with degradation due to corrosion rebars and expected extended service life of structure with strengthening of distressed members are furnished. However, these functional-related distress features call for appropriate treatment to avoid further deterioration and to improve the durability and longevity of the structure.

On carrying out the recommended remedial measures effectively under the guidance of experienced technical personnel by an experienced agency, the distress in the building will be minimized.

After carrying out the recommended remedial measures effectively it is mandatory to carry out periodic maintenance of the building as per standard practice.

# ANNEXURES

# TEST REPORTS

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# TEST REPORT

Contract No – 17671143/4
Date of Receipt – 27/12/2022
M/s. Army Welfare Housing Organization
C/o Prasanna Vihar, Marine Drive,
Opp. High Court, Kochi – 682 031.

ULR No – TC600623200000118F
Date of submission – 25th April 2023


## RESULTS OF ULTRASONIC PULSE VELOCITY TEST

| | | |
|---|---|---|
| **Project** | : | Structural Stability Assessment Existing Chanderkunj Army Residential Tower-C of Army Welfare Housing Organization, Kochi, Kerala. |
| **Members tested** | : | RC Corbels, Columns, Beams & Slab |
| **Period of test** | : | 18th January 2023 to 23rd February 2023 |
| **Grade of concrete** | : | M30* |
| **Age of concrete** | : | More than 28 days* |
| **Test instrument** | : | PUNDIT LAB+ (Portable Ultrasonic Non-destructive Digital Indicating Tester) |
| **Make** | : | M/s. Proceq, Switzerland |
| **Test method** | : | Direct & Indirect Method |
| **Technical reference** | : | a. Indian Standard IS: 516 (Part-5/Sec 1)-2018<br>b. Instrument manual furnished by M/s. Proceq, Switzerland |
| **Temperature** | : | 33°C |

NDT
Building Materials
Reinforced Concrete Structures

| Sl. No. | Floor / Member Identification* | Grid Identification* | Average Pulse Velocity (Km/Sec) | Remarks |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| **Tower B and C - Basement Floor** | | | | **Refer quality grading chart for in-situ concrete** |
| 1 | **RC Corbels** | 10b/Mb-Lb | 3.53 | |
| 2 | | 3b/Lb-Mb | 3.57 | |
| 3 | | Mb/1b | 3.91 | |
| 4 | | Kb/1b | 3.66 | |
| 5 | | 1b/Bb | 3.52 | |
| 6 | | 1b/Ab | 4.08 | |
| 7 | | 3b/Ab-Bb | 2.52 | |
| 8 | | 10b/Ab-Bb | 3.81 | |
| 9 | | 10c/Mc | 3.59 | |
| 10 | | 3c/Mc | 3.32 | |
| 11 | | 1c/Mc | 3.81 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 12 | RC Corbels | 1c/Kc | 3.76 | Refer quality grading chart for in-situ concrete |
| 13 | | Cc/1c | 3.43 | |
| 14 | | 1c/Ac | 3.40 | |
| 15 | | 3c/Ac | 3.73 | |
| 16 | | 10c/Ac | 4.30 | |
| **Tower - C** | | | | |
| **Ground Floor** | | | | |
| 17 | RC Column | Lc/5c | 3.67 | |
| 18 | | Lc/1c | 3.62 | |
| 19 | | Hc/2c | 3.27 | |
| 20 | | Bc/2c | 3.08 | |
| 21 | | Cc/3c | 3.89 | |
| 22 | | Bc/8c | 3.77 | |
| 23 | | Bc/11c | 3.66 | |
| 24 | | Ac/12c | 3.63 | |
| 25 | | Ac/10c | 4.13 | |
| 26 | | Lc/10c | 3.45 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 27 | RC Beam | 6c/Lc-Mc | 3.67 | Refer quality grading chart for in-situ concrete |
| 28 | | Lc-Kc/2c | 3.85 | |
| 29 | | Lc-Mc/11c | 3.82 | |
| 30 | | Ec-Hc/2c | 3.44 | |
| 31 | | Bc-Ac/8c | 3.90 | |
| 32 | | Bc/10c-11c | 3.83 | |
| 33 | | Bc-Cc/10c | 3.91 | |
| 34 | RC Slab | Mc-Lc/8c-10c | 4.18 | |
| 35 | | Lc-Kc/3c-5c | 4.38 | |
| 36 | | Kc-Lc/10c-11c | 4.11 | |
| 37 | | Lc-Kc/11c-12c | 4.15 | |
| 38 | | Ec-Cc/1c-2c | 4.43 | |
| 39 | | Bc-Cc/10c-11c | 4.38 | |
| 40 | | Ac-Bc/9c-10c | 4.34 | |
| **First Floor** | | | | |
| 41 | RC Column | Kc-10c | 3.21 | |
| 42 | RC Beam | Kc /10c-11c | 3.98 | |
| 43 | | Cc-Dc/9c | 4.01 | |
| 44 | | Kc-Jc/4c | 4.01 | |
| 45 | | Hc/3c-4c | 3.86 | |
| 46 | RC Slab | Dc-Cc/4c-5c | 4.02 | |
| 47 | | Hc-Kc/10c-11c | 3.89 | |
| **Second Floor** | | | | |
| 48 | RC Column | Cc-10c | 3.23 | |
| 49 | | Cc-3c | 3.15 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 50 | **RC Column** | Mc-2c | 4.01 | **Refer quality grading chart for in-situ concrete** |
| 51 | | Mc-11c | 4.08 | |
| 52 | **RC Beam** | Cc/10c-11c | 3.88 | |
| 53 | | Dc-Cc/4c | 3.89 | |
| 54 | | Kc-Hc/11c | 3.48 | |
| 55 | | Cc/2c-3c | 3.83 | |
| 56 | **RC Slab** | Lc-Mc/10c-11c | 3.10 | |
| 57 | | Ac-Bc/11c-12c | 3.94 | |
| 58 | | Bc-Cc/2c-3c | 4.88 | |
| 59 | | Mc-Lc/1c | 5.74 | |
| 60 | | Mc-Lc/10c-11c | 3.98 | |
| **Third Floor** | | | | |
| 61 | **RC Column** | Kc-2c | 5.10 | |
| 62 | | Kc-10c | 3.21 | |
| 63 | | Ac-11c | 4.09 | |
| 64 | | Ac-2c | 3.56 | |
| 65 | **RC Beam** | Cc-Dc/9c | 3.43 | |
| 66 | | Ec/3c-4c | 4.31 | |
| 67 | | Kc/10c-11c | 3.61 | |
| 68 | | Bc-Cc/11c | 4.18 | |
| 69 | | Kc-Jc/4c | 4.03 | |
| 70 | | Cc-Bc/8c | 3.95 | |
| 71 | | Bc-Cc/2c | 4.56 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 72 | RC Slab | Kc-Lc/10c-11c | 5.35 | Refer quality grading chart for in-situ concrete |
| 73 | | Mc-Lc/1c-2c | 5.06 | |
| 74 | | Kc-Gc/3c-4c | 5.12 | |
| 75 | | Bc-Cc/1c-2c | 4.65 | |
| **Fourth Floor** | | | | |
| 76 | RC Column | Cc-11c | 3.81 | |
| 77 | | Cc-C3 | 3.18 | |
| 78 | | Kc-2c | 3.53 | |
| 79 | | Kc-11c | 3.71 | |
| 80 | RC Beam | Kc/2c-3c | 3.36 | |
| 81 | | Kc/10c-11c | 3.10 | |
| 82 | | Kc-Jc/9c | 3.75 | |
| 83 | | Cc-10c | 3.74 | |
| 84 | | Cc/2c-3c | 3.19 | |
| 85 | RC Slab | Ec-Cc/10c-11c | 5.08 | |
| 86 | | Cc-Bc/2c-3c | 4.09 | |
| 87 | | Dc-Cc/5c-9c | 4.12 | |
| 88 | | Mc-Lc/10c-11c | 5.08 | |
| **Fifth Floor** | | | | |
| 89 | RC Column | Ac-12c | 3.13 | |
| 90 | | Hc-2c | 4.55 | |
| 91 | | Ac-C2 | 3.43 | |
| 92 | | Kc-10c | 3.77 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 93 | RC Beam | Ec/11c-12c | 3.63 | Refer quality grading chart for in-situ concrete |
| 94 | | Kc/2c-3c | 3.67 | |
| 95 | | Hc/3c-4c | 3.33 | |
| 96 | | Dc-Cc/9c | 3.38 | |
| 97 | | Ec-Hc/11c | 4.41 | |
| 98 | | Cc/2c-3c | 3.08 | |
| 99 | RC Slab | Mc-Lc/2c-3c | 4.91 | |
| 100 | | Lc-Kc/8c-6c | 4.33 | |
| 101 | | Ac-Bc/1c-2c | 3.98 | |
| 102 | | Ac-Bc/11c-12c | 5.15 | |
| 103 | | Hc-Ec/3c-4c | 4.37 | |
| **Sixth Floor** | | | | |
| 104 | RC Column | Ac-11c | 3.76 | |
| 105 | | Cc-2c | 3.47 | |
| 106 | | Kc-2c | 3.13 | |
| 107 | | Kc-11c | 3.80 | |
| 108 | RC Beam | Cc-Ec/11c | 3.44 | |
| 109 | | Cc/2c-3c | 3.42 | |
| 110 | | Kc/2c-3c | 3.30 | |
| 111 | | Jc-Kc/4c | 3.44 | |
| 112 | | Kc-Lc/11c | 3.41 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 113 | RC Slab | Bc-Ac/11c-12c | 3.71 | Refer quality grading chart for in-situ concrete |
| 114 | | Cc-Ec/1c-2c | 4.21 | |
| 115 | | Kc-Hc/1c-2c | 3.78 | |
| 116 | | Bc-Cc/6c-8c | 4.24 | |
| 117 | | Kc-Lc/11c-12c | 4.25 | |
| **Seventh Floor** | | | | |
| 118 | RC Column | Cc-10c | 3.37 | |
| 119 | | Ac-2c | 3.50 | |
| 120 | | Kc-2c | 4.17 | |
| 121 | | Kc-11c | 3.50 | |
| 122 | RC Beam | Cc-Dc/12c | 3.63 | |
| 123 | | Lc/1c-2c | 3.63 | |
| 124 | | Kc/2c-3c | 3.49 | |
| 125 | | Hc/11c-12c | 3.57 | |
| 126 | RC Slab | Ac-Bc/2c-3c | 3.71 | |
| 127 | | Ac-Bc/11c-12c | 4.27 | |
| 128 | | Kc-Hc/1c-2c | 3.75 | |
| 129 | | Lc-Kc/1c-2c | 3.57 | |
| 130 | | Lc-Kc/10c-11c | 3.54 | |
| **Eighth Floor** | | | | |
| 131 | RC Column | Kc-5c | 4.13 | |
| 132 | | Ac-2c | 4.40 | |
| 133 | | Mc-11c | 4.31 | |
| 134 | | Kc-2c | 3.85 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 135 | RC Beam | Kc-Lc/3c | 3.48 | Refer quality grading chart for in-situ concrete |
| 136 | | Bc-Cc/3c | 3.37 | |
| 137 | | Lc/10c-11c | 2.80 | |
| 138 | | Lc-Kc/3c | 4.11 | |
| 139 | RC Slab | Mc-Lc/2c-3c | 3.87 | |
| 140 | | Bc-Cc/1c-2c | 3.30 | |
| 141 | | Kc-Lc/10c-11c | 4.09 | |
| 142 | | Mc-Lc/1c-2c | 4.52 | |
| **Nineth Floor** | | | | |
| 143 | RC Column | Cc-10c | 4.11 | |
| 144 | | Ac-2c | 4.66 | |
| 145 | | Mc-2c | 3.63 | |
| 146 | RC Beam | Ec/11c-12c | 3.23 | |
| 147 | | Bc/2c-3c | 3.09 | |
| 148 | | Lc-Kc/3c | 3.48 | |
| 149 | RC Slab | Cc-Ec/10c-11c | 4.22 | |
| 150 | | Bc-Cc/2c-3c | 3.87 | |
| 151 | | Mc-Lc/2c-3c | 4.18 | |
| **Tenth Floor** | | | | |
| 152 | RC Column | Cc-10c | 3.06 | |
| 153 | | Kc-3c | 3.88 | |
| 154 | | Kc-11c | 3.27 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 155 | **RC Column** | Cc-2c | 3.54 | **Refer quality grading chart for in-situ concrete** |
| 156 | **RC Beam** | Bc-Cc/11c | 3.53 | |
| 157 | | Mc-Lc/2c | 3.24 | |
| 158 | | Ac-Bc/2c | 3.48 | |
| 159 | | Lc/10c-11c | 3.52 | |
| 160 | **RC Slab** | Cc-Bc/11c | 4.02 | |
| 161 | | Mc-Lc/1c-2c | 3.61 | |
| 162 | | Bc-Ac/3c-5c | 4.36 | |
| 163 | | Kc-Lc/11c-12c | 4.24 | |
| **Eleventh Floor** | | | | |
| 164 | **RC Column** | Cc-11c | 3.22 | |
| 165 | | Ac-2c | 4.27 | |
| 166 | | Kc-11c | 4.05 | |
| 167 | | Mc-2c | 3.20 | |
| 168 | | Kc-11c | 3.38 | |
| 169 | **RC Beam** | Ec/11c-12c | 3.59 | |
| 170 | | Cc-Bc/2c | 3.34 | |
| 171 | | Kc-Lc/11c | 3.12 | |
| 172 | | Lc-Kc/1c-2c | 3.54 | |
| 173 | | Mc-Lc/1c-2c | 3.58 | |
| 174 | | Lc-Mc/1c | 4.22 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 175 | RC Slab | Ac-Bc/11c-12c | 4.72 | Refer quality grading chart for in-situ concrete |
| 176 | | Bc-Cc/5c-3c | 4.10 | |
| 177 | | Hc-Kc/11c-12c | 4.13 | |
| 178 | | Mc-Lc/1c-2c | 4.54 | |
| 179 | | Mc-Lc/11c-12c | 4.50 | |
| **Twelfth Floor** | | | | |
| 180 | RC Column | Mc-2c | 3.18 | |
| 181 | | Kc-11c | 3.96 | |
| 182 | | Cc-2c | 4.01 | |
| 183 | | Cc-9c | 4.01 | |
| 184 | RC Beam | Lc/2c-3c | 3.15 | |
| 185 | | Kc/10c-11c | 3.63 | |
| 186 | | Bc-Cc/3c | 3.31 | |
| 187 | | Cc/10c-11c | 3.15 | |
| 188 | RC Slab | Lc-Kc/2c-3c | 4.63 | |
| 189 | | Kc-Lc/11c-12c | 4.18 | |
| 190 | | Ac-Bc/1c-2c | 5.12 | |
| 191 | | Ac-Bc/11c-12c | 4.18 | |
| **Thirteenth Floor** | | | | |
| 192 | RC Column | Ac-11c | 3.35 | |
| 193 | | Ac-2c | 4.33 | |
| 194 | | Kc-11c | 3.22 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 195 | **RC Column** | Mc-2c | 4.58 | **Refer quality grading chart for in-situ concrete** |
| 196 | **RC Beam** | Bc-Cc/11c-10c | 3.24 | |
| 197 | | Ac-Bc/1c-2c | 3.48 | |
| 198 | | Kc/10c-11c | 3.31 | |
| 199 | | Lc-Kc/2c | 3.26 | |
| 200 | **RC Slab** | Ac-Bc/10c-11c | 4.09 | |
| 201 | | Ac-Bc/1c-2c | 4.46 | |
| 202 | | Lc-Kc/11c-12c | 5.55 | |
| 203 | | Kc-Lc/1c-2c | 4.01 | |
| **Fourteenth Floor** | | | | |
| 204 | **RC Column** | Mc-2c | 4.24 | |
| 205 | | Cc-2c | 4.05 | |
| 206 | | Mc-11c | 3.31 | |
| 207 | | Ac-11c | 3.56 | |
| 208 | **RC Beam** | Kc/2c-3c | 3.36 | |
| 209 | | Bc-Cc/3c | 4.07 | |
| 210 | | Cc/10c-11c | 3.48 | |
| 211 | | Kc/10c-11c | 4.00 | |
| 212 | **RC Slab** | Hc-Kc/1c-2c | 4.34 | |
| 213 | | Ac-Bc/1c-2c | 4.42 | |
| 214 | | Ac-Bc/11c-12c | 4.42 | |
| 215 | | Bc-Cc/10c-11c | 4.83 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 216 | **RC Slab** | Mc-Lc/10c-11c | 4.56 | **Refer quality grading chart for in-situ concrete** |
| **Fifteenth Floor** | | | | |
| 217 | **RC Column** | Kc-11c | 4.84 | |
| 218 | | Cc-10c | 4.01 | |
| 219 | **RC Beam** | Lc-Kc/11c | 3.56 | |
| 220 | | Bc/10c-11c | 4.02 | |
| 221 | **RC Slab** | Lc-Kc/11c-12c | 4.65 | |
| 222 | | Bc-Cc/11c-12c | 4.31 | |
| **Sixteenth Floor** | | | | |
| 223 | **RC Column** | Cc-11c | 3.18 | |
| 224 | | Kc-2c | 3.85 | |
| 225 | | Cc-2c | 3.43 | |
| 226 | | Kc-11c | 3.89 | |
| 227 | | Lc-11c | 3.78 | |
| 228 | **RC Beam** | Cc/10c-11c | 3.48 | |
| 229 | | Mc-Lc/2c | 3.35 | |
| 230 | | Kc-Lc/9c | 4.04 | |
| 231 | | Lc/11c-12c | 3.92 | |
| 232 | | Bc-Cc/3c | 3.05 | |
| 233 | | Cc/9c-10c | 3.84 | |
| 234 | | Jc-Kc/9c | 3.41 | |
| 235 | | Ec/9c-10c | 3.98 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 236 | RC Slab | Ac-Bc/11c-12c | 4.42 | Refer quality grading chart for in-situ concrete |
| 237 | | Lc-Mc/1c-2c | 4.56 | |
| 238 | | Mc-Lc/11c-12c | 3.83 | |
| **Seventeenth Floor** | | | | |
| 239 | RC Column | Cc-3c | 4.53 | |
| 240 | | Kc-2c | 3.87 | |
| 241 | | Cc-10c | 3.33 | |
| 242 | | Mc-11c | 3.01 | |
| 243 | RC Beam | Bc-Cc/3c | 3.84 | |
| 244 | | Kc/2c-3c | 3.80 | |
| 245 | | Lc-Kc/11c | 3.68 | |
| 246 | | Bc-Cc/10c | 3.03 | |
| 247 | RC Slab | Ac-Bc/1c-2c | 4.81 | |
| 248 | | Kc-Lc/2c-3c | 4.18 | |
| 249 | | Lc-Mc/10c-11c | 3.77 | |
| 250 | | Ac-Bc/11c-12c | 5.45 | |
| **Eighteenth Floor** | | | | |
| 251 | RC Column | Ac-2c | 3.68 | |
| 252 | | Mc-4c | 4.02 | |
| 253 | | Cc-11c | 3.77 | |
| 254 | RC Beam | Bc-Cc/2c | 3.50 | |
| 255 | | Kc-Lc/10c | 3.40 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 256 | RC Beam | Cc/10c-11c | 3.22 | Refer quality grading chart for in-situ concrete |
| 257 | | Ec/3c-4c | 3.17 | |
| 258 | | Kc-Jc/4c | 3.10 | |
| 259 | RC Slab | Bc-Cc/1c-2c | 4.54 | |
| 260 | | Lc-Mc/11c-12c | 4.76 | |
| 261 | | Cc-Bc/9c-10c | 5.17 | |
| 262 | | Cc-Dc/4c-3c | 4.20 | |
| **Nineteenth Floor** | | | | |
| 263 | RC Column | Ac-2c | 4.11 | |
| 264 | | Mc-2c | 3.91 | |
| 265 | | Kc-10c | 3.52 | |
| 266 | RC Beam | Bc/2c-3c | 3.95 | |
| 267 | | Kc/2c-3c | 3.65 | |
| 268 | | Lc/10c-11c | 3.18 | |
| 269 | | Dc-Cc/9c | 3.03 | |
| 270 | | Ec/3c-4c | 3.87 | |
| 271 | RC Slab | Lc-Kc/1c-2c | 5.12 | |
| 272 | | Ac-Bc/1c-2c | 4.30 | |
| 273 | | Lc-Kc/11c-12c | 4.22 | |
| 274 | | Mc-Lc/10c-11c | 5.15 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Twentieth Floor** | | | | **Refer quality grading chart for in-situ concrete** |
| 275 | **RC Column** | Cc-2c | 3.41 | |
| 276 | | Mc-2c | 3.27 | |
| 277 | | Ac-11c | 3.06 | |
| 278 | **RC Beam** | Cc/2c-3c | 3.05 | |
| 279 | | Mc-Lc/2c | 3.66 | |
| 280 | | Bc/10c-11c | 3.25 | |
| 281 | | Kc-Jc/4c | 3.48 | |
| 282 | | Dc-Cc/4c | 3.25 | |
| 283 | **RC Slab** | Bc-Cc/1c-2c | 5.35 | |
| 284 | | Lc-Kc/1c-2c | 4.36 | |
| **Twenty-first floor** | | | | |
| 285 | **RC Column** | Cc-11c | 2.91 | |
| 286 | | Mc-2c | 3.15 | |
| 287 | | Cc-3c | 4.11 | |
| 288 | **RC Beam** | Bc-Cc/10c | 3.48 | |
| 289 | | Jc-Kc/9c | 3.22 | |
| 290 | | Cc/2c-3c | 3.27 | |
| 291 | | Kc/2c-3c | 3.20 | |
| 292 | | Ec/3c-4c | 3.85 | |
| 293 | **RC Slab** | Bc-Cc/8c-10c | 3.64 | |
| 294 | | Ac-Bc/1c-2c | 4.18 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 295 | **RC Slab** | Lc-Kc/1c-2c | 4.02 | |
| **Twenty-second floor** | | | | |
| 296 | **RC Column** | Cc-2c | 4.01 | |
| 297 | | Cc-10c | 3.09 | |
| 298 | | Kc-2c | 3.54 | |
| 299 | **RC Beam** | Bc-Cc/3c | 3.25 | |
| 300 | | Bc-Cc/10c | 3.05 | |
| 301 | | Hc/3c-4c | 4.71 | |
| 302 | | Kc-Jc/4c | 3.65 | |
| 303 | | Lc-Kc/3c | 3.92 | |
| 304 | **RC Slab** | Ac-Bc/1c-2c | 4.83 | **Refer quality grading chart for in-situ concrete** |
| 305 | | Bc-Cc/11c-12c | 4.25 | |
| 306 | | Mc-Lc/1c-2c | 4.09 | |
| **Twenty-third Floor** | | | | |
| 307 | **RC Column** | Kc-11c | 4.07 | |
| 308 | | Cc-11c | 3.41 | |
| 309 | **RC Beam** | Kc/10c-11c | 3.63 | |
| 310 | | Kc-Jc/9c | 3.86 | |
| 311 | | Cc/10c-11c | 3.40 | |
| 312 | | Ec/3c-4c | 3.57 | |
| 313 | **RC Slab** | Lc-Mc/12c-13c | 4.76 | |
| 314 | | Cc-Dc/6c-8c | 4.12 | |

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|---|---|---|---|---|
| 315 | **RC Slab** | Ac-Bc/11c-12c | 4.37 | **Refer quality grading chart for in-situ concrete** |
| **Twenty-fourth Floor** | | | | |
| 316 | **RC Column** | Cc-3c | 3.13 | |
| 317 | | Ac-11c | 3.66 | |
| 318 | | Mc-11c | 3.22 | |
| 319 | | Kc-2c | 3.56 | |
| 320 | **RC Beam** | Cc/2c-3c | 4.00 | |
| 321 | | Cc/10c-11c | 3.17 | |
| 322 | | Dc-Cc/9c | 4.12 | |
| 323 | | Hc/3c-4c | 3.67 | |
| 324 | | Kc-Lc/11c | 3.39 | |
| 325 | | Kc/1c-2c | 4.22 | |
| 326 | | Cc-Dc/9c | 3.55 | |
| 327 | | Ec/1c-2c | 3.28 | |
| 328 | **RC Slab** | Bc-Cc/2c-3c | 5.35 | |
| 329 | | Ac-Bc/10c-11c | 5.17 | |
| 330 | | Lc-Mc/8c-10c | 5.60 | |
| 331 | | Lc-Kc/3c-5c | 4.13 | |
| **Twenty-fifth Floor** | | | | |
| 332 | **RC Column** | Ac-2c | 3.59 | |
| 333 | | Cc-11c | 4.05 | |
| 334 | | Kc-2c | 3.32 | |

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| 335 | **RC Column** | Mc-11c | 3.61 | **Refer quality grading chart for in-situ concrete** |
| 336 | **RC Beam** | Bc-Cc/3c | 3.32 | |
| 337 | | Bc-Cc/10c | 3.59 | |
| 338 | | Mc-Lc/2c | 3.28 | |
| 339 | | Lc-Kc/10c | 4.26 | |
| 340 | | Cc-Dc/9c | 3.63 | |
| 341 | | Ec/4c-3c | 3.20 | |
| 342 | **RC Slab** | Bc-Cc/1c-2c | 4.12 | |
| 343 | | Ec-Cc/9c-10c | 4.47 | |
| 344 | | Ac-Bc/1c-2c | 4.06 | |
| 345 | | Mc-Lc/1c-2c | 4.85 | |
| 346 | | Hc-Kc/11c-12c | 4.73 | |
| **Twenty sixth floor** | | | | |
| 347 | **RC Column** | Ac/11c | 3.34 | |
| 348 | | Ac/2c | 4.22 | |
| 349 | | Kc/3c | 3.36 | |
| 350 | | Kc/11c | 3.62 | |
| 351 | **RC Beam** | Lc/2c-3c | 3.17 | |
| 352 | | Bc-Cc/11c | 3.17 | |
| 353 | | Bc/2c-3c | 3.65 | |
| 354 | | Kc/11c-12c | 3.63 | |
| 355 | | Kc-Jc/4c | 3.81 | |

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| 356 | **RC Beam** | Hc/3c-4c | 3.34 | **Refer quality grading chart for in-situ concrete** |
| 357 | **RC Slab** | Mc-Lc/11c-12c | 4.13 | |
| 358 | | Mc-Lc/2c-3c | 4.36 | |
| 359 | | Ac-Bc/1c-2c | 3.87 | |
| 360 | | Ac-Bc/11c-12c | 4.12 | |
| **Tower C – Lift 1 - Shear Wall** | | | | |
| 361 | **Basement floor** | Fc/4c-7c | 4.41 | |
| 362 | **Ground Floor** | Fc/4c-7c | 2.43 | |
| 363 | **1st Floor** | Fc/4c-7c | De-bonded | |
| 364 | | 7c/Dc-Fc | De-bonded | |
| 365 | **2nd Floor** | Fc/4c-7c | De-bonded | |
| 366 | | 7c/Dc-Fc | De-bonded | |
| 367 | **3rd Floor** | Fc/4c-7c | De-bonded | |
| 368 | | 7c/Dc-Fc | De-bonded | |
| 369 | **4th Floor** | 4c/Dc-Fc | De-bonded | |
| 370 | **5th Floor** | Fc/4c-7c | 2.5 | |
| 371 | **6th Floor** | 4c/Dc-Fc | De-bonded | |
| 372 | | Fc/4c-7c | De-bonded | |
| **Tower C – Lift 1 - Shear Wall** | | | | |
| 373 | **7th Floor** | Fc/4c-7c | De-bonded | |
| 374 | **8th Floor** | Fc/4c-7c | De-bonded | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 375 | 9th Floor | 4c/Dc-Fc | De-bonded | Refer quality grading chart for in-situ concrete |
| 376 | | Fc/4c-7c | 2.9 | |
| 377 | | Fc/4c-7c | De-bonded | |
| 378 | 11th Floor | 7c/Dc-Fc | 2.9 | |
| 379 | 12th Floor | Fc/4c-7c | De-bonded | |
| 380 | 13th Floor | 4c/Dc-Fc | De-bonded | |
| 381 | 14th Floor | Fc/4c-7c | 2.6 | |
| 382 | 16th Floor | 4c/Dc-Fc | De-bonded | |
| 383 | 17th Floor | Fc/4c-7c | 2.9 | |
| 384 | 19th Floor | 4c/Dc-Fc | De-bonded | |
| 385 | 23rd Floor | 4c/Dc-Fc | 2.6 | |
| 386 | 26th Floor | Fc/4c-7c | 2.6 | |
| Tower C – Lift 2 - Shear Wall | | | | |
| 387 | Basement Floor | 7c/Dc-Fc | De-bonded | |
| 388 | Ground Floor | 7c/Dc-Fc | 2.5 | |
| 389 | 1st Floor | 7c/Dc-Fc | De-bonded | |
| 390 | | Dc/7c-9c | De-bonded | |
| 391 | 3rd Floor | 7c/Dc-Fc | De-bonded | |
| 392 | 4th Floor | Fc/7c-9c | 2.9 | |
| 393 | 5th Floor | Fc/7c-9c | De-bonded | |
| 394 | 7th Floor | Fc/7c-9c | De-bonded | |
| 395 | 8th Floor | 7c/Dc-Fc | 2.8 | |
| Tower C – Lift 2 - Shear Wall | | | | |
| 396 | 10th Floor | Fc/7c-9c | De-bonded | |
| 397 | 12th Floor | Fc/7c-9c | De-bonded | |
| 398 | 13th Floor | 7c/Dc-Fc | 2.8 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 399 | **15th Floor** | 7c/Dc-Fc | De-bonded | **Refer quality grading chart for in-situ concrete** |
| 400 | **17th Floor** | Fc/7c-9c | 2.6 | |
| 401 | **21st Floor** | 7c/Dc-Fc | De-bonded | |
| 402 | **23rd Floor** | 7c/Dc-Fc | 2.8 | |
| 403 | **24th floor** | Dc/7c-9c | 2.6 | |
| 404 | **26th Floor** | 7c/Dc-Fc | 3.1 | |
| **Tower C – Lift 3 - Shear Wall** | | | | |
| 405 | **Basement Floor** | 5c/Fc-Gc | 3.7 | |
| 406 | | Fc/7c-9c | 3.5 | |
| 407 | **Ground Floor** | 5c/Fc-Gc | 3.0 | |
| 408 | **2nd Floor** | 5c/Fc-Gc | De-bonded | |
| 409 | **3rd Floor** | Gc/7c-9c | 2.8 | |
| 410 | **4th Floor** | Fc/7c-9c | De-bonded | |
| 411 | **7th Floor** | Fc/7c-9c | 2.9 | |
| 412 | | Gc/7c-9c | De-bonded | |
| 413 | **9th Floor** | 5c/Fc-Gc | De-bonded | |
| 414 | **10th Floor** | 5c/Fc-Gc | 2.9 | |
| 415 | **11th Floor** | 5c/Fc-Gc | De-bonded | |
| 416 | | Fc/7c-9c | De-bonded | |
| 417 | **14th Floor** | 5c/Fc-Gc | De-bonded | |
| 418 | | Fc/7c-9c | De-bonded | |
| **Tower C – Lift 3 - Shear Wall** | | | | |
| 419 | **15th Floor** | 5c/Fc-Gc | De-bonded | |
| 420 | **16th Floor** | Fc/7c-9c | De-bonded | |
| 421 | **17th Floor** | 5c/Fc-Gc | 2.9 | |

*Indicates information supplied by the customer for which the laboratory has no control. Sampling not done by laboratory, results relate to the sample received.
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ASHOSH. J
Technical Manager - NDT & RR

Bureau Veritas India Pvt. Ltd.
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Banashankari 2nd Stage, Bangalore -560070
Ph: 080-26980200, Mob: +918050118118
Mail Id : ndt.bangalore@bureauveritas.com

Contract No – 17671143/4
Date of Receipt – 27/12/2022

ULR No – TC600623200000118F
Date of submission – 25th April 2023



| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 422 | **20th Floor** | Fc/7c-9c | 2.7 | |
| 423 | **23rd Floor** | 5c/Fc-Gc | 2.7 | |
| 424 | **26th Floor** | 5c/Fc-Gc | 2.6 | |
| **Tower C – Lift 4 - Shear Wall** | | | | |
| 425 | **Basement Floor** | 7c/Gc-Jc | De-bonded | |
| 426 | | Jc/7c-9c | De-bonded | |
| 427 | **1st Floor** | 7c/Gc-Jc | 2.7 | |
| 428 | **3rd Floor** | 7c/Gc-Jc | De-bonded | |
| 429 | **4th Floor** | Jc/7c-9c | De-bonded | |
| 430 | **5th Floor** | 7c/Gc-Jc | De-bonded | |
| 431 | **6th Floor** | Jc/7c-9c | De-bonded | |
| 432 | **7th Floor** | Jc/7c-9c | 2.8 | **Refer quality grading chart for in-situ concrete** |
| 433 | **8th Floor** | 7c/Gc-Jc | 2.9 | |
| 434 | **9th Floor** | 7c/Gc-Jc | De-bonded | |
| 435 | **10th Floor** | Gc/7c-9c | De-bonded | |
| 436 | **11th Floor** | Gc/7c-9c | De-bonded | |
| 437 | | 7c/Gc-Jc | De-bonded | |
| 438 | **12th Floor** | Jc/7c-9c | 3.1 | |
| 439 | **13th Floor** | 7c/Gc-Jc | De-bonded | |
| **Tower C – Lift 4 - Shear Wall** | | | | |
| 440 | **16th Floor** | 7c/Gc-Jc | 3.0 | |
| 441 | **19th Floor** | 7c/Gc-Jc | 3.1 | |
| 442 | **22nd Floor** | 7c/Gc-Jc | 3.1 | |
| 443 | **26th Floor** | 7c/Gc-Jc | 3.0 | |

ASHISH. J
Technical Manager - NDT & RR

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**Bureau Veritas India Pvt. Ltd.**
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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Tower C – Lift 5 - Shear Wall** | | | | **Refer quality grading chart for in-situ concrete** |
| 444 | **Basement Floor** | Gc/4c-7c | 3.0 | |
| 445 | **Ground Floor** | Gc/4c-7c | De-bonded | |
| 446 | **4th Floor** | Gc/4c-7c | 2.9 | |
| 447 | **5th Floor** | 4c/Gc-Jc | De-bonded | |
| 448 | **6th Floor** | 7c/Gc-Jc | De-bonded | |
| 449 | **7th Floor** | 4c/Gc-Jc | De-bonded | |
| 450 | **8th Floor** | 7c/Gc-Jc | 2.8 | |
| 451 | **11th Floor** | 7c/Gc-Jc | 3.8 | |
| 452 | **12th Floor** | 4c/Gc-Jc | De-bonded | |
| 453 | **14th Floor** | 4c/Gc-Jc | 3.4 | |
| 454 | **18th Floor** | Gc/4c-7c | 2.9 | |
| 455 | **21th Floor** | Gc/4c-7c | 3.4 | |
| 456 | **26th Floor** | Gc/4c-7c | 3.4 | |

*#Refer sketch **DWG.REF.No GL/BF-01 to GL/29F/TC-30** for Floor / Member / Grid Identification.*
**As furnished by the customer.*

***Note:***

1. The results relate only to the sample tested.
2. Report shall not be reproduced, expect in full, without the written approval of the lab.
3. The report shall be read in line with disclaimer given at rear side of the report.
4. Any correction invalidate this report.

AVINASH. J
Technical Manager - NDT & RR

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## REFERENCE QUALITY GRADING CHART FOR (ULTRASONIC PULSE VELOCITY TEST)

**Instrument** : PUNDIT [Portable Ultrasonic Non-Destructive Digital Indicating Tester]

**Make** : M/s. Proceq, Switzerland

**i) For Concrete (≤M25)**

| Pulse Velocity (Km/sec) | Concrete Quality Grading |
|---|---|
| Below 3.5 | Doubtful |
| 3.5 to 4.5 | Good |
| Above 4.5 | Excellent |

**ii) For Concrete (>M25)**

| Pulse Velocity (Km/sec) | Concrete Quality Grading |
|---|---|
| Below 3.75 | Doubtful |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

**Note:** Concrete quality grading for different velocity criterion as reproduced from Table-1 of IS 516 (Part 5/Sec1): 2018 Clause 2.5.2 Amendment November -2019.

In case of "Doubtful quality", it may be necessary to carry out further testing.

******

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ULR NO - TC600623200000118F
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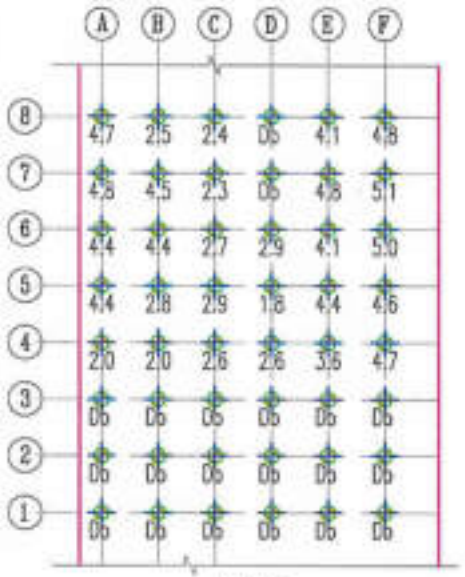
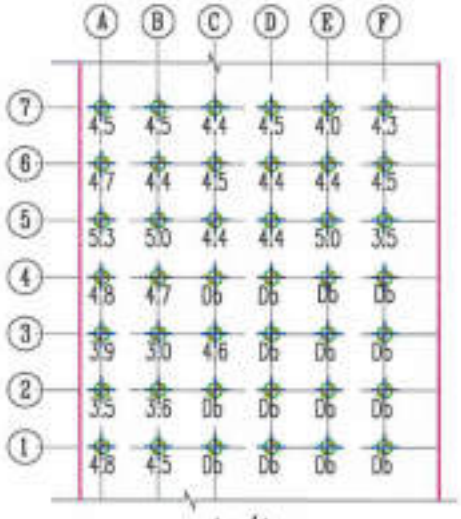
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



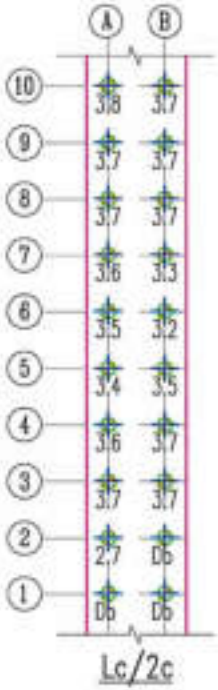

Lc/4c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 440



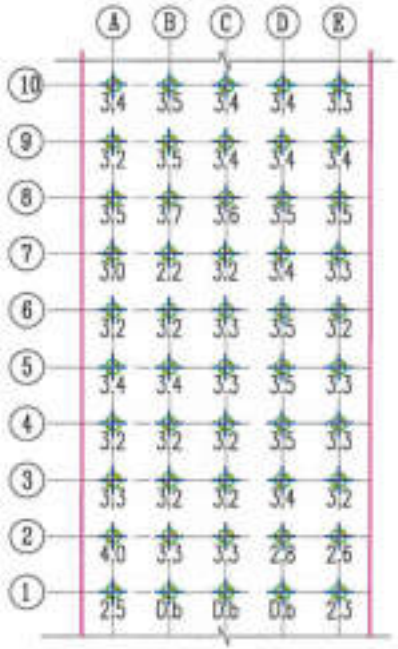

Lc/1c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 440




Lc/2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 740




(Lc-3c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER [illegible]] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & [illegible]

BUREAU VERITAS (INDIA) PVT. LTD.
[illegible]

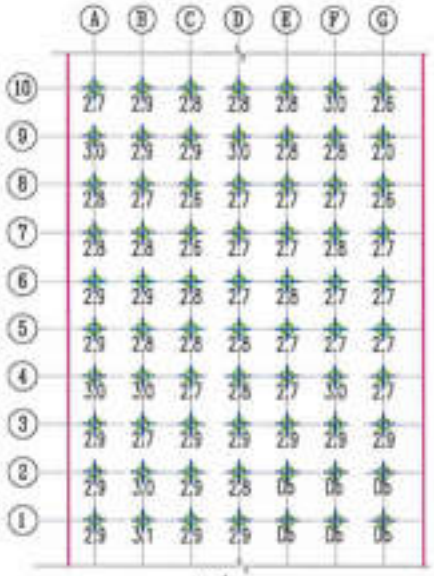
NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. [illegible]-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
**UPVT RESULTS**

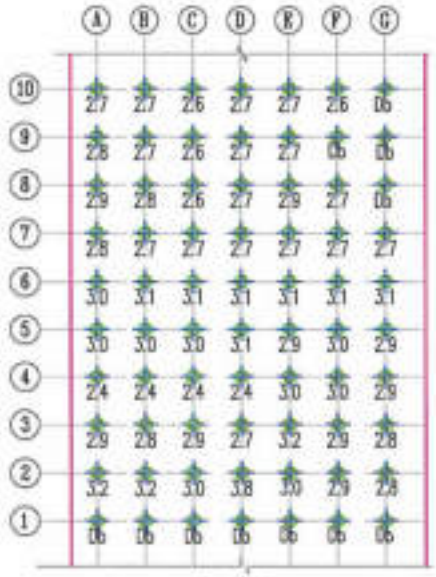
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 26 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



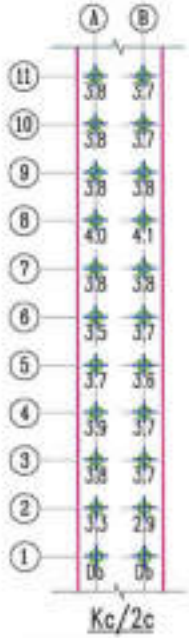

Lc/8c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330



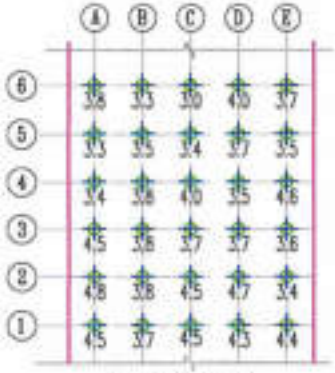

Lc/5c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




Kc/2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 740




Lc-Kc/3c-4c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

CONCRETE QUALITY GRADING CHART FOR M30
ULTRASONIC PULSE VELOCITY TEST
(AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & DT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. XX – VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. GRIDS FURNISHED BY CLIENT)
6. AGE OF CONCRETE – MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
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M/S. ARMY WELFARE HOUSING ORGANIZATION
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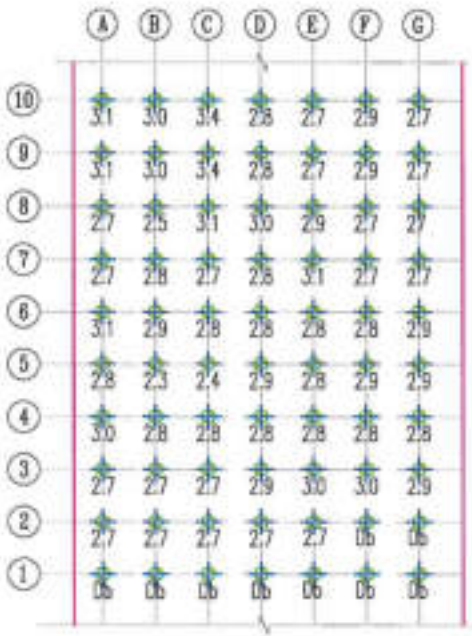
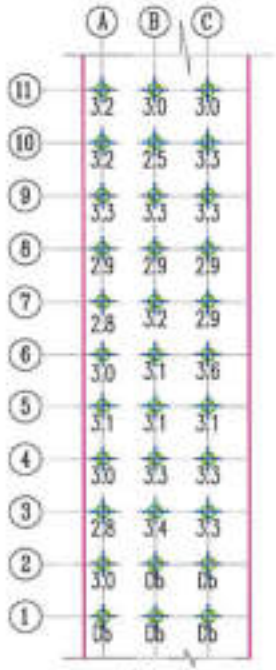
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



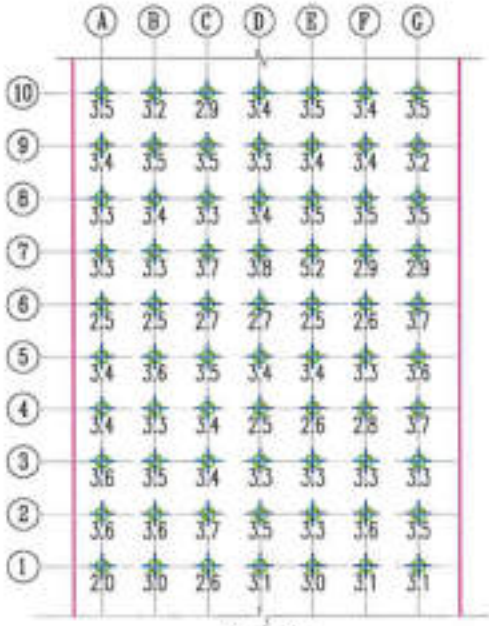

Kc/3c-4c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 630



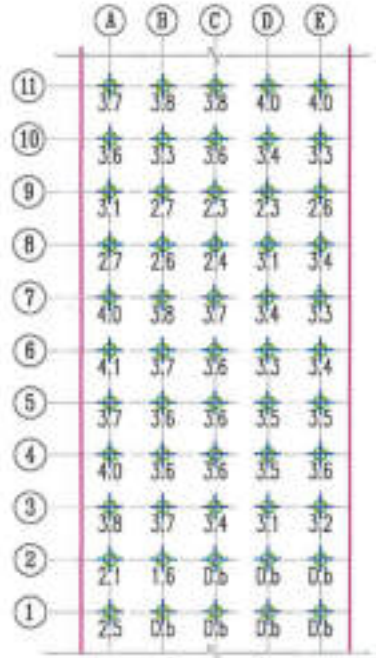

Kc-6c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 630




Kc/10c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




(Cc-12c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 360

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS516 (PART 5/SEC 1) : 2018 (Amendment-November 2019))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & ...

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *DOS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 03 FOR MEMBER/GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
**UPVT RESULTS**

CONSULTANT
BUREAU VERITAS (INDIA) PVT. LTD.
[illegible]

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C/O PRASANNA VIHAR, MARINE DRIVE,
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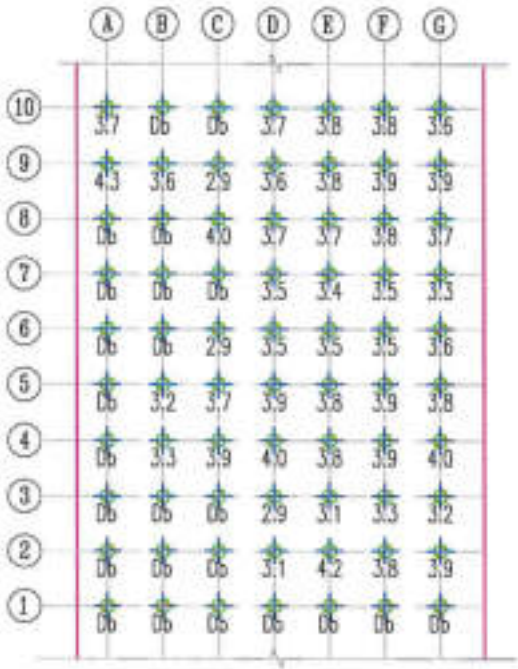
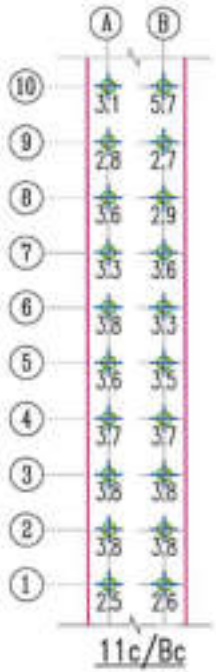
# TEST REPORT



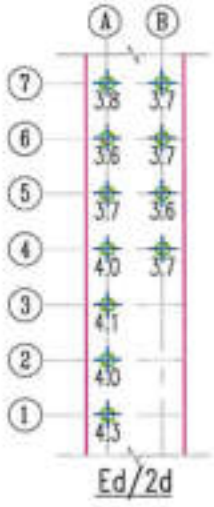

8c/Bc

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 430



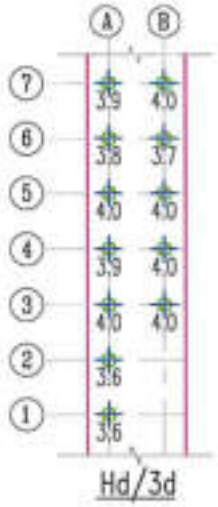

11c/Bc

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 740




Ed/2d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Hd/3d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340

CONCRETE QUALITY GRADING CHART FOR
ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018
(Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.8 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 03 FOR MEMBER/ GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

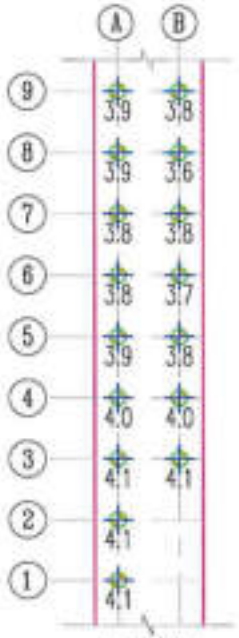
TITLE
UPVT RESULTS

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023

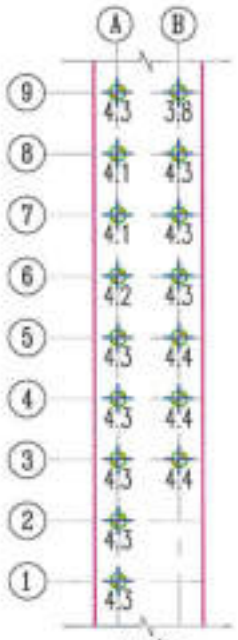
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



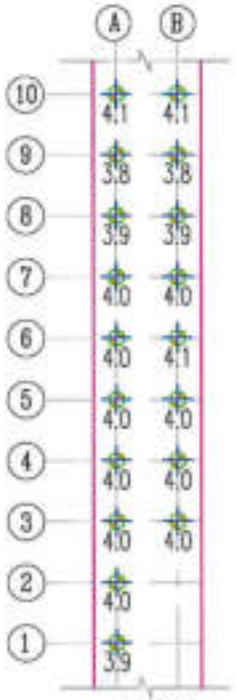

Ed/4d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340



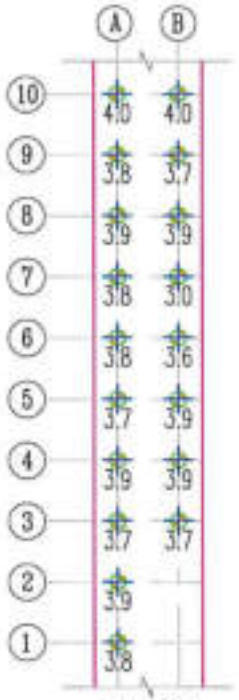

Ed/6d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Hd/6d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Md/6d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANT
BUREAU VERITAS (INDIA) PVT. LTD.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.9 - VALUES INDICATES VELOCITY OF PULSE in Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT.
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

DATE OF RECEIPT -27/12/2022
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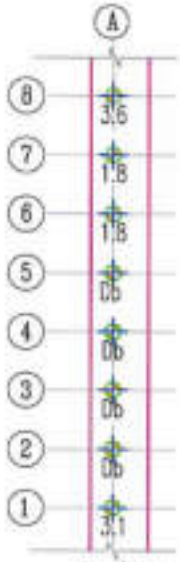
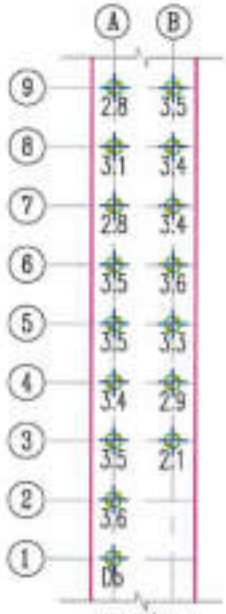
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



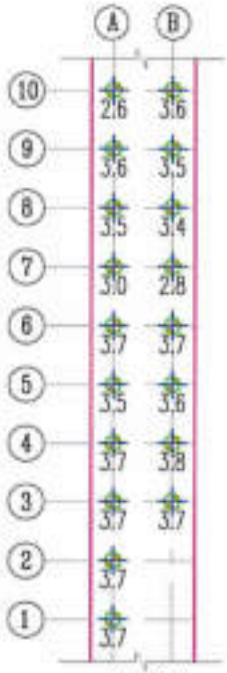

Sd/6d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330



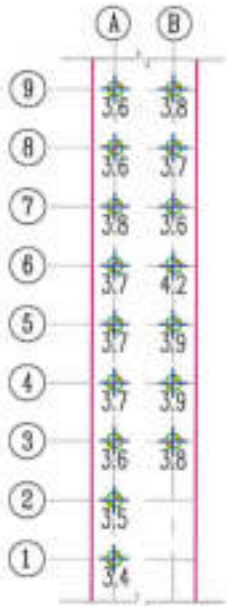

Sd/7d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




Sd/9d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




Rd/12d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.6 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
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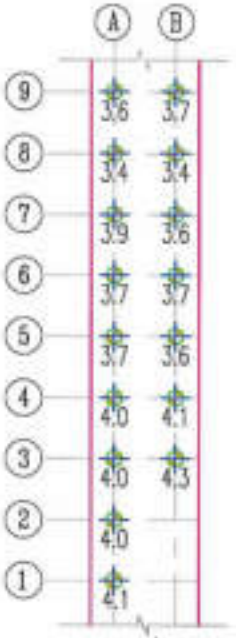
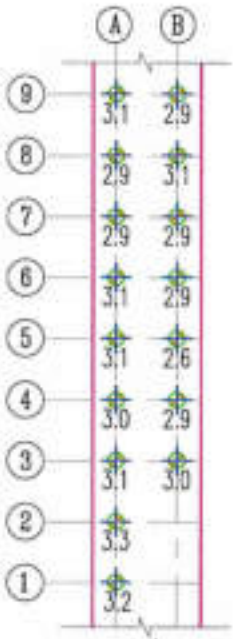
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



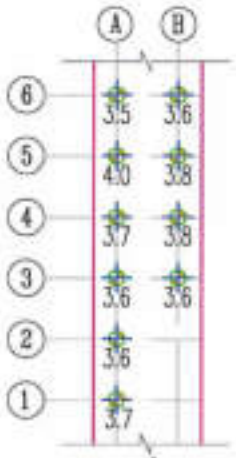

Md/12d

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 340 |



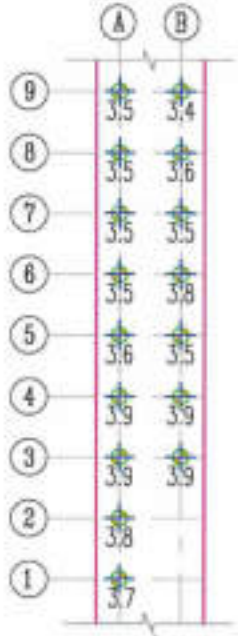

Hd/12d

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 320 |




Fd/13d

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 340 |




Hd/14d

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 340 |

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (3.6) - VALUES INDICATES VELOCITY OF PULSE IN KM/SEC (TYP).
5. *NIS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. UC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/ GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
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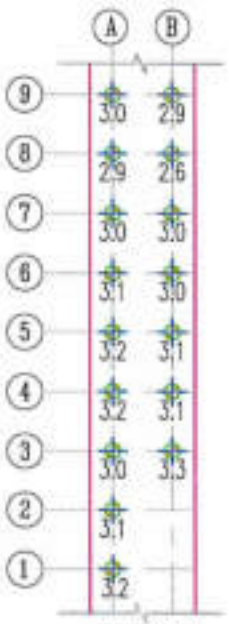
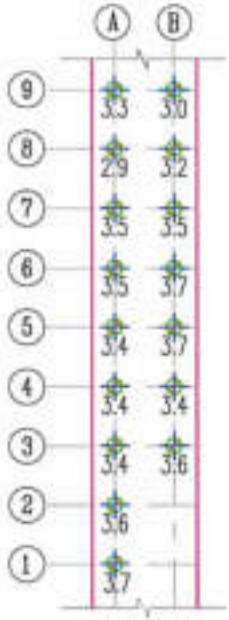
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



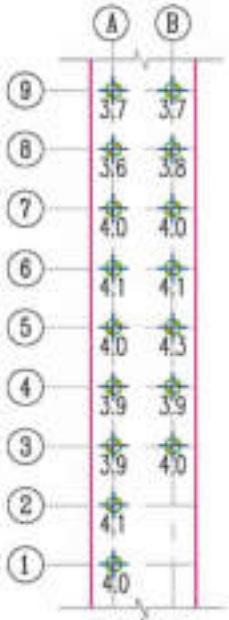

Kd/13d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340



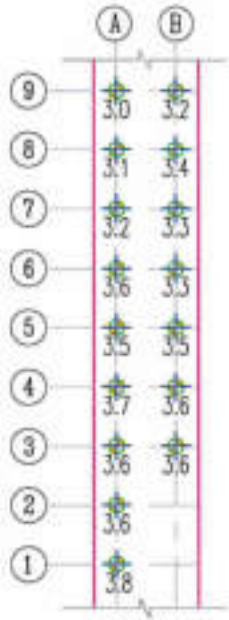

Md/14d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Pd/13d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Rd/14d

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH, J
Technical Manager

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. [illegible] FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. [illegible] INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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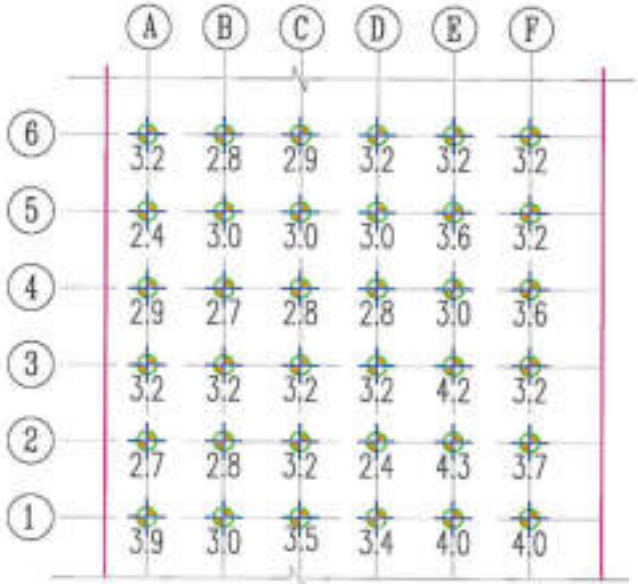
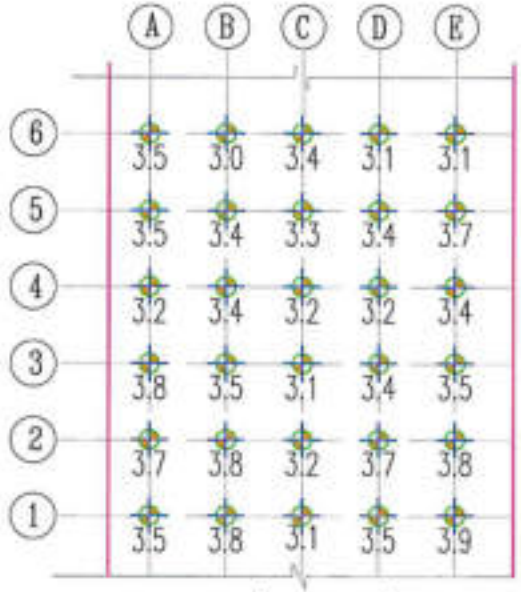
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



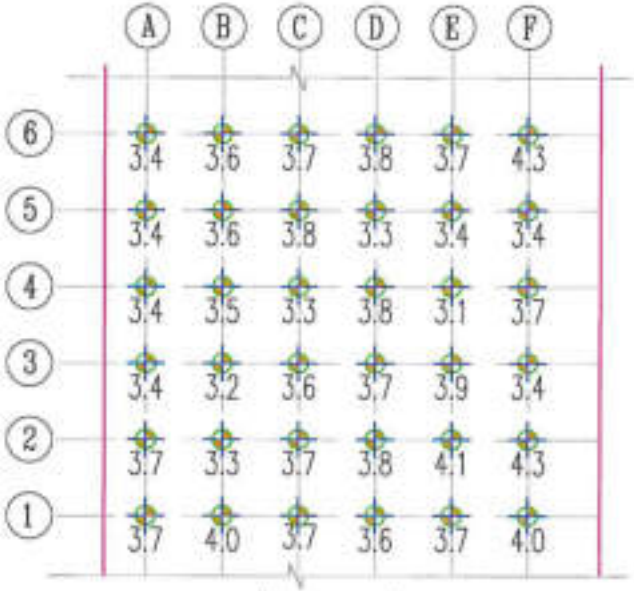

4d/5d-Bd/Ed

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




3d/4d-Bd/Ed

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




1d/2d-Hd/Jd

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. XX - VALUES INDICATES VELOCITY OF PULSE (X.Xkm/Sec)(DP).
5. AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

AVINASH
Technical Manager

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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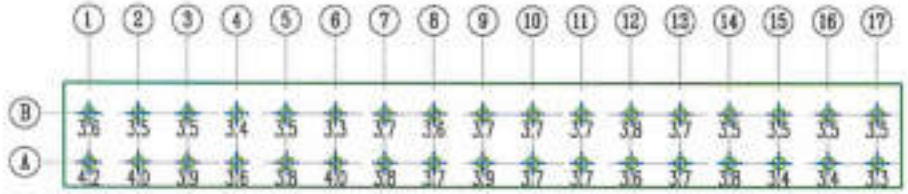
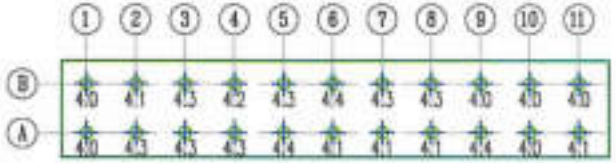
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




4d/Ed-Hd

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

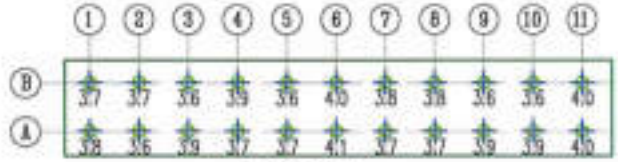



3d/Hd-Kd

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340

2d/Ed-Bd

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




5d/Bd-Ed

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Reaffirmed-November 2019))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & [illegible]

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANT
BUREAU VERITAS (INDIA) PVT. LTD.
[illegible]

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] - VALUES INDICATES VELOCITY OF PULSE [illegible] km/Sec.(TYP).
5. AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. UC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

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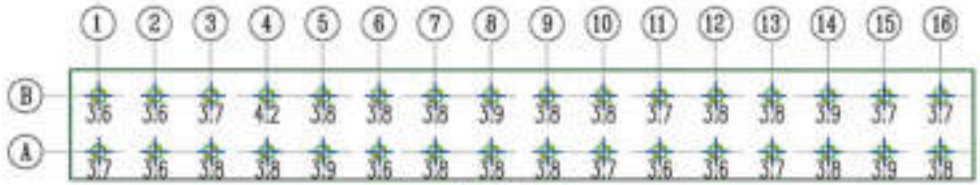
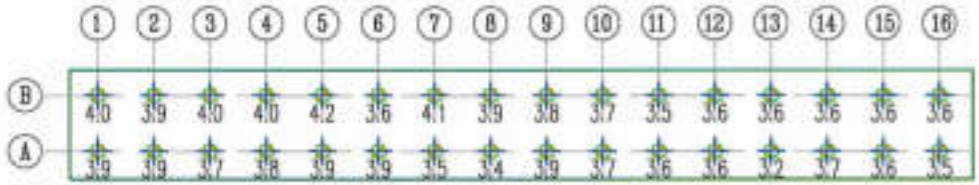
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




Hd/5d-6d

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Pd/6d-Ac

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 320

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

AVINASH. J
Technical Manager - Non-

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.6 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. UC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

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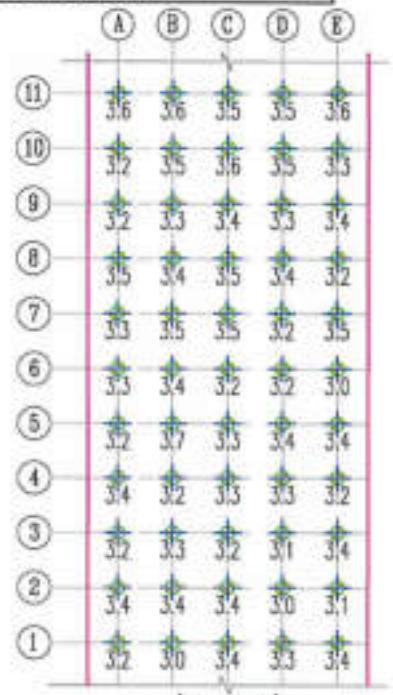
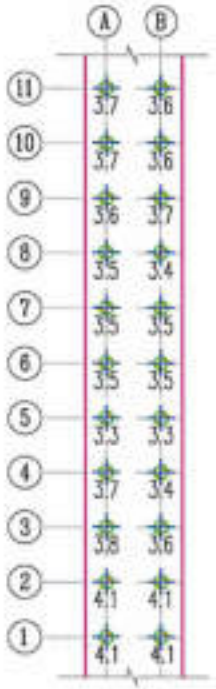
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



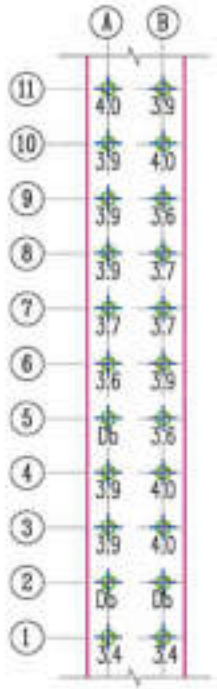

(Kc-12c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 350



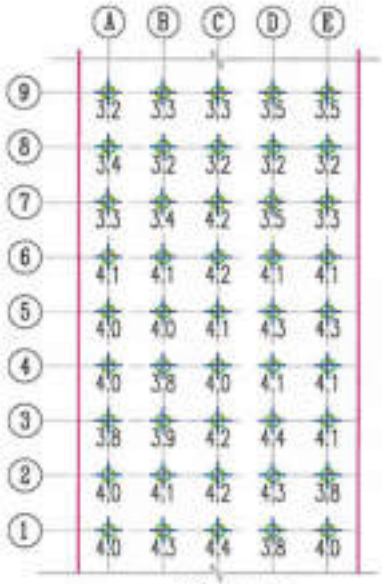

Kc/11c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 740




Lc/11c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 740




(12c-Mc)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 350

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & RR

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. ( ) - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

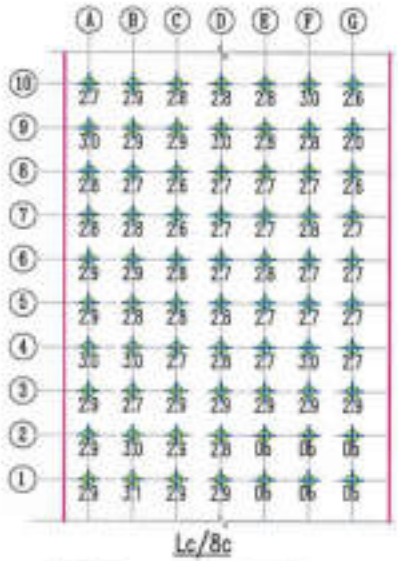
TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023

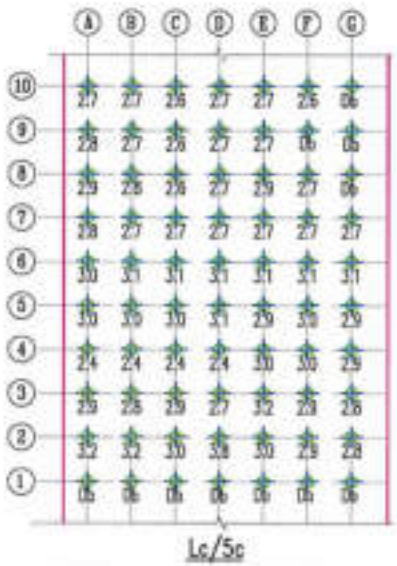
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



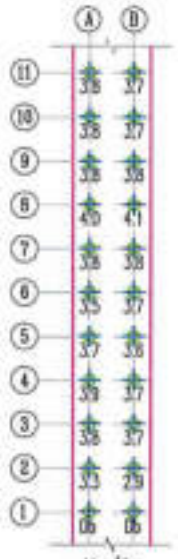

Lc/8c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330



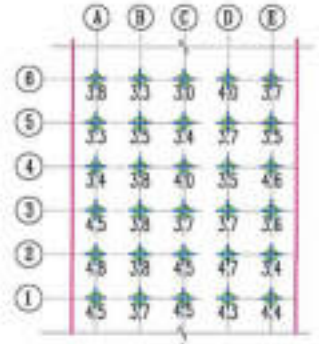

Lc/5c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




Kc/2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 740




Lc-Kc/3c-4c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & RR

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (xx) - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

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C/O PRASANNA VIHAR, MARINE DRIVE,
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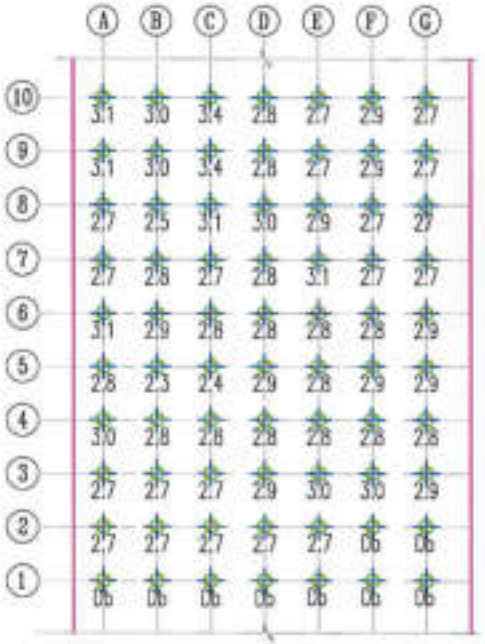
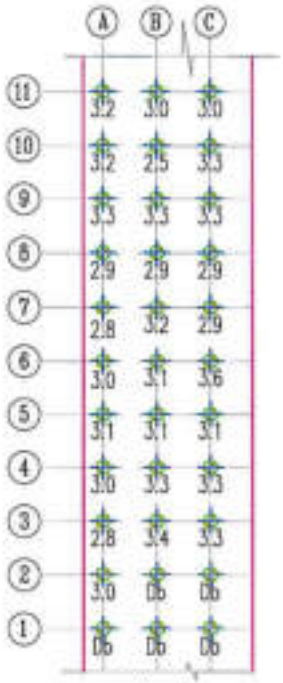
# TEST REPORT



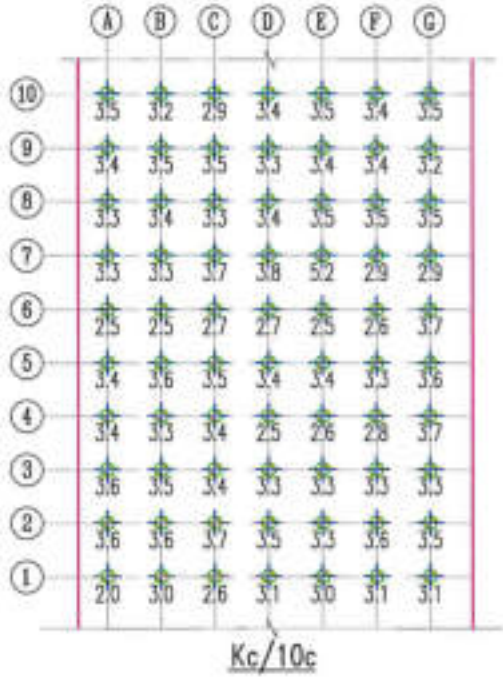

Kc/3c-4c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330



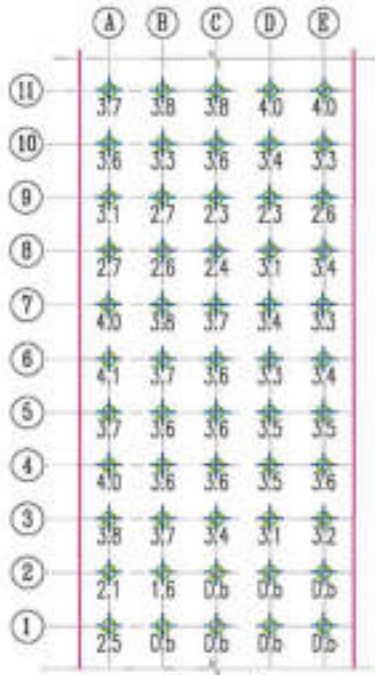

Kc-6c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 630




Kc/10c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




(Cc-12c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 360

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 [Amendment-November 2019]]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 2.75 | Doubtful* |
| 2.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 2.5 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SECTION DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

AVINASH. J
Technical Manager - NDT &

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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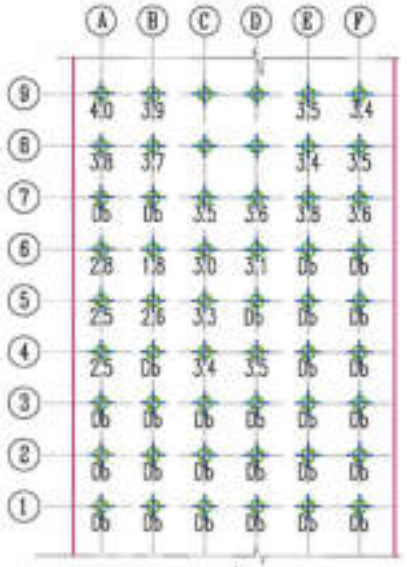
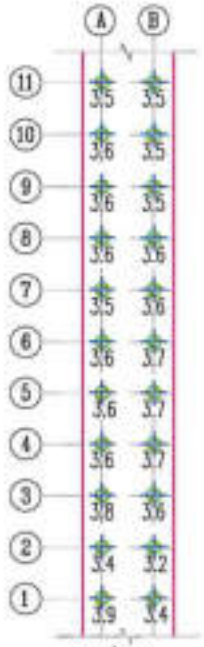
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



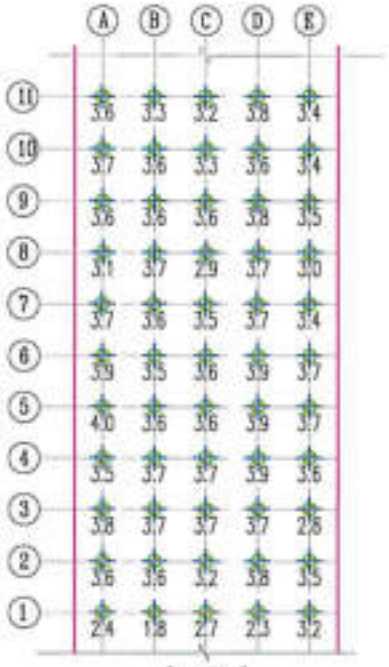

Ac/11c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340




Bc/2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 750




(Bc-3c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & RC

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. XX - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. SC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

DATE OF RECEIPT -27/12/2022
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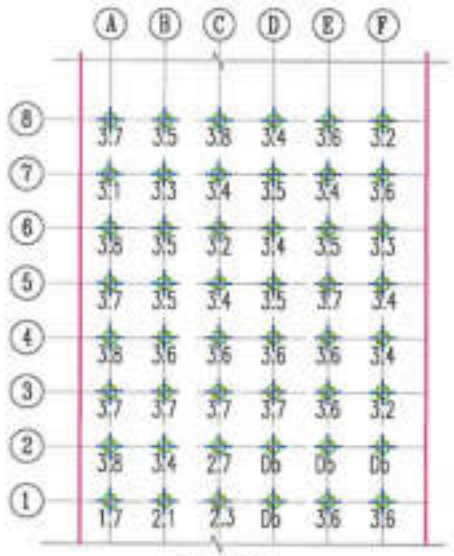
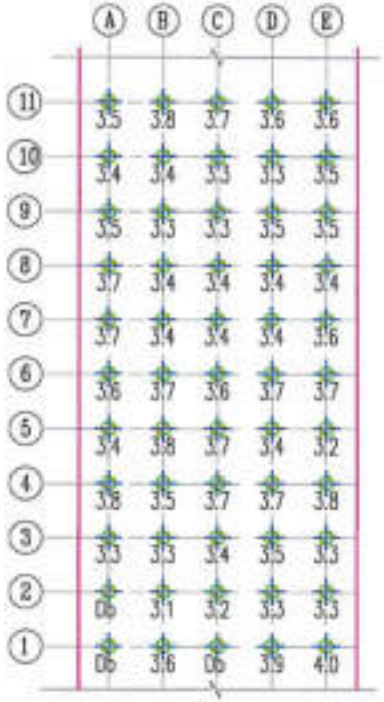
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



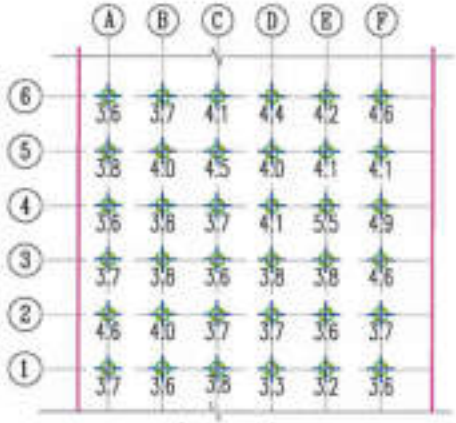

(Bc-1c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




(Cc-1c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




Bc/Cc-8c/10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

ER-C)

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 [Amendment-November 2019]] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & R

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [ ] – VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE – MORE THAN 28 DAYS.
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

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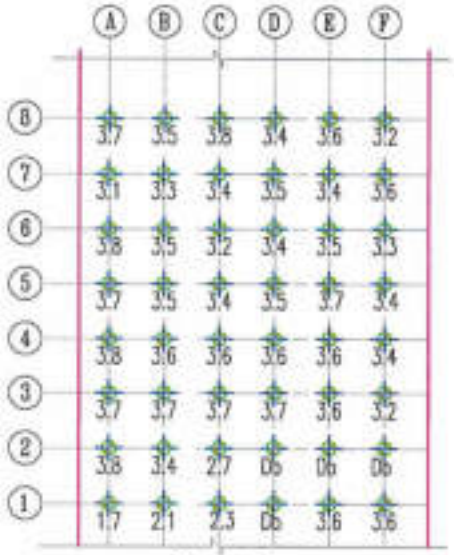
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT

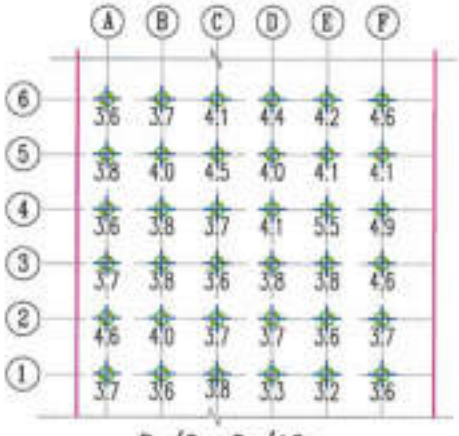



(Bc-1c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

(Cc-1c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330




Bc/Cc-8c/10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

WER-C)

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & RP

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.7 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AXIS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. DC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

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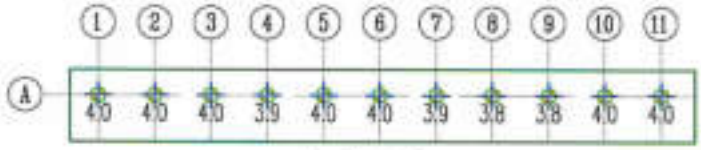
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT

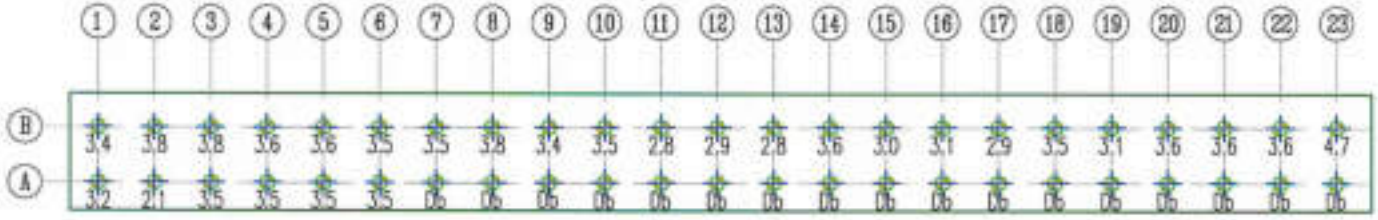



Bc/8c-10c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 225

Ec-Fc/11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230




Ac/3c-10c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 350

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & RR

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. ★ - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. NC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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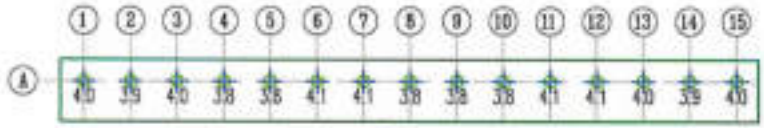
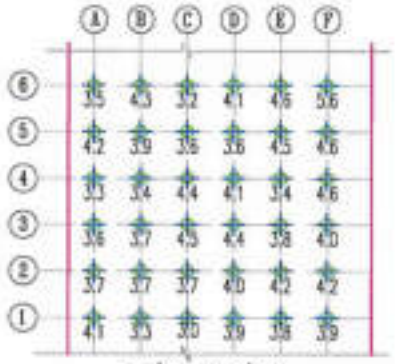
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



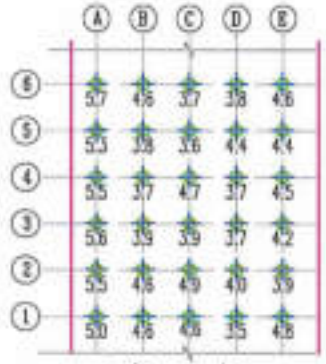

Ec-Fc/11c-10c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230



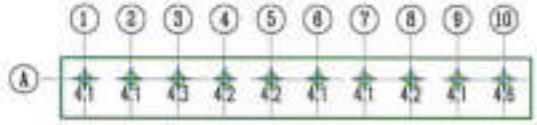

Ec/Cc-12c/11c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)




Ec/Fc-10c/11c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

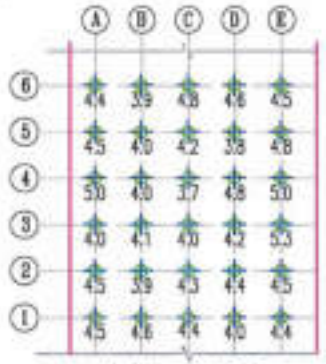



Kc-Hc/11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230

Cc/Bc-2c/3c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




Kc/Hc-11c/12c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

CONCRETE QUALITY GRADING CHART FOR 300
ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018
(Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & RE

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.0 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 03 FOR MEMBER/GRID IDENTIFICATION.

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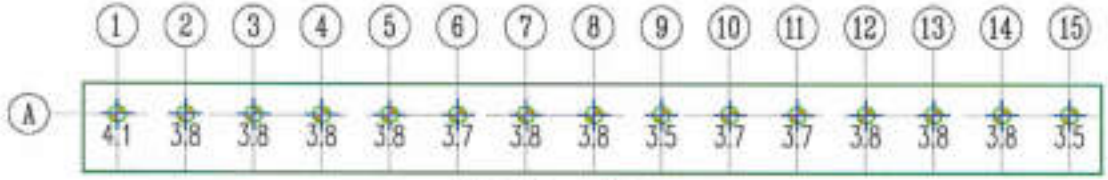
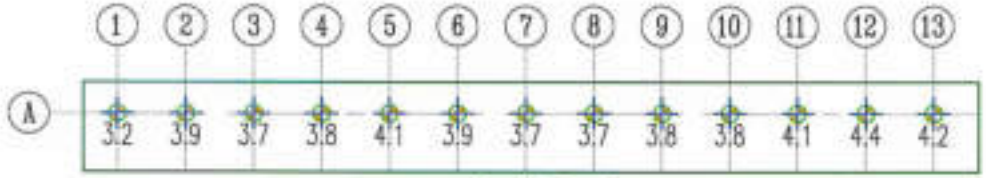
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




Kc/11c-10c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230




Lc/10c-9c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230

AVINASH. J
Technical Manager - NDT & RR

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [value] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. (C-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING S1 TO S5 FOR MEMBER/GRID IDENTIFICATION.

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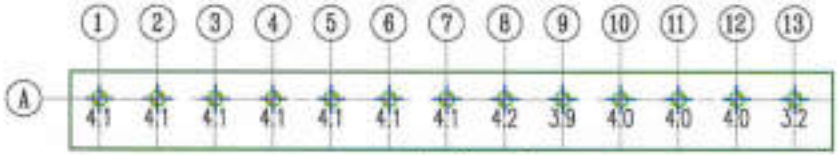
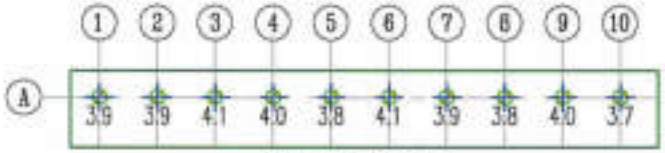
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



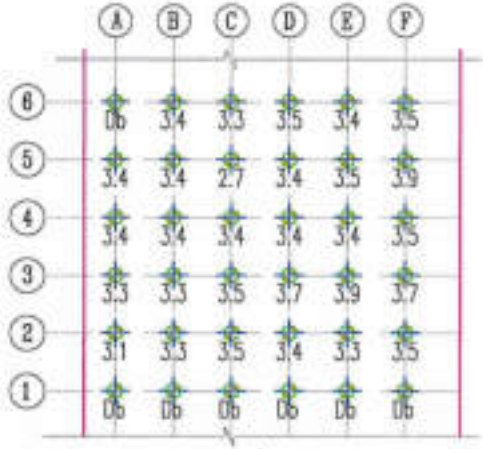

Kc/3c-6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230




Cc-Kc/3c-4c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230




Kc/1c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANT
BUREAU VERITAS (INDIA) PVT. LTD.

AVINASH. J
Technical Manager - NDT & RR

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.9 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

DATE OF RECEIPT -27/12/2022
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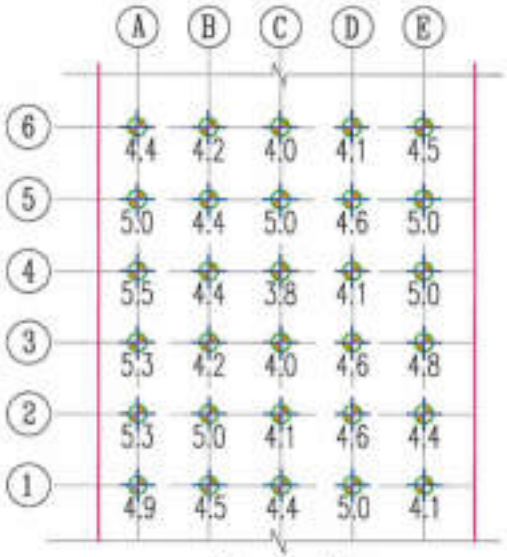
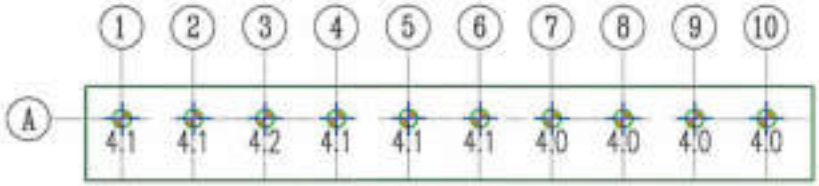
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



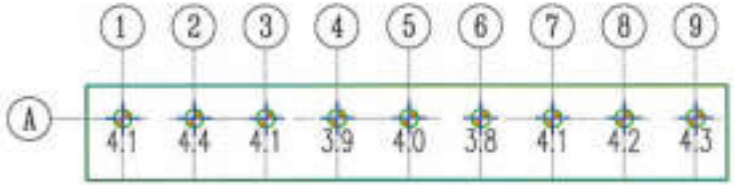

Kc-Cc/1c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




Bc/3c-2c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230




Bc-Ac/2c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & DT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.1 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.[TYP].
5. *AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

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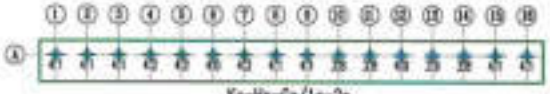
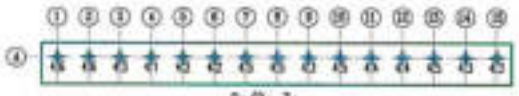
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



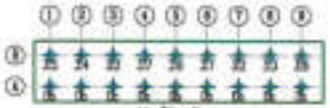
Ke-He-Ge/1c-2c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230



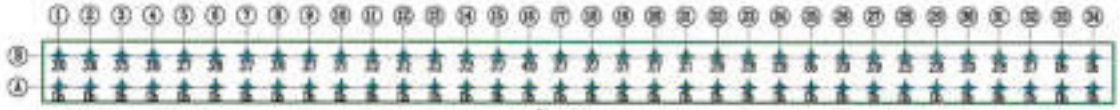
Ce/2c-3c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230



Me/2c-3c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 420



Me/3c-10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30*
METHOD OF TEST : DIRECT
FLOOR : BASEMENT FLOOR(TOWER-C)
PATH LENGTH : 300

1c/Ke-Ce

MEMBER : RC SLAB
GRADE OF CONCRETE : M30*
METHOD OF TEST : DIRECT
FLOOR : BASEMENT FLOOR(TOWER-C)
PATH LENGTH : 300

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.20 | Good |
| Above 4.20 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & [illegible]

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.75 – VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE – MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING C1 TO C5 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.
[illegible]

DATE OF RECEIPT -27/12/2022
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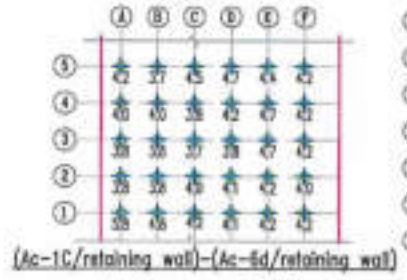
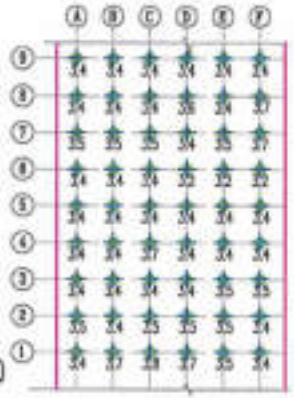
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



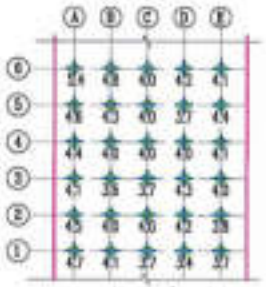
(Ac-1C/retaining wall)-(Ac-6d/retaining wall)

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330



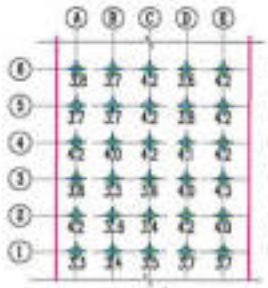
Hc-Gc/3c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 340



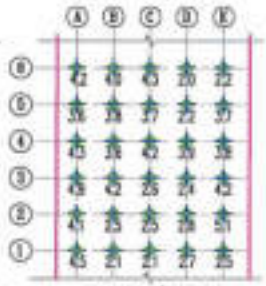
Kc-Cc/1c-2c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



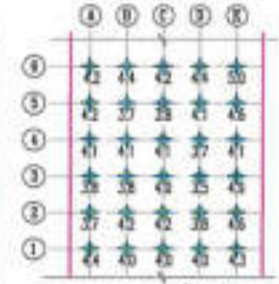
Kc-Lc/1c-2c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



9d-10d/5d-Rd

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



14d-17b/5d-Rd

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & [illegible]

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.5 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(THP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. AS-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

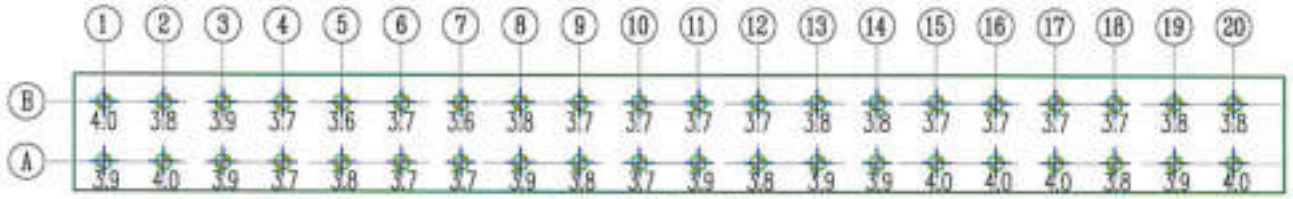
PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
**UPVT RESULTS**

CONSULTANT
BUREAU VERITAS (INDIA) PVT. LTD.
[illegible]

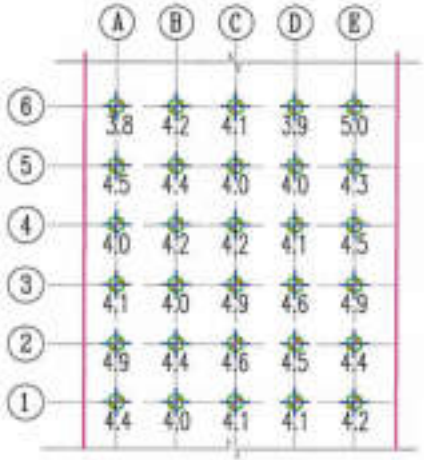
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 51 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




Hd/6c-Ac

MEMBER : RC BEAM
GRADE OF CONCRETE : M30*
METHOD OF TEST : DIRECT
FLOOR : BASEMENT FLOOR(TOWER-C)
PATH LENGTH : 330




Hb-Kb/10b-11b

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/ GRID IDENTIFICATION.

DATE OF RECEIPT -27/12/2022
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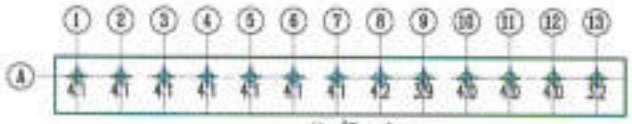
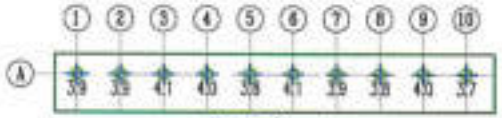
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



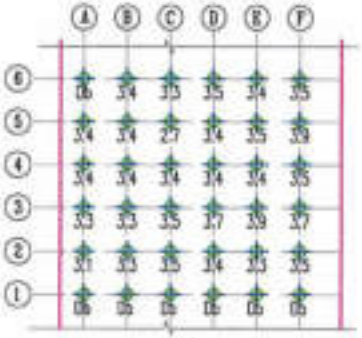

Kc/3c-6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230



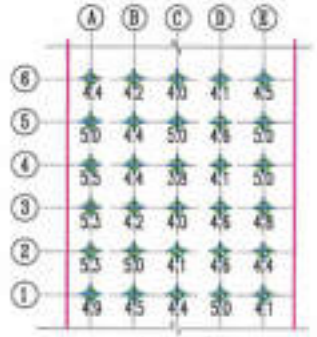

Cc-Kc/3c-4c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230



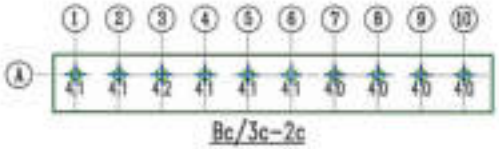

Kc/1c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 330



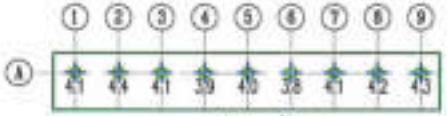

Kc-Cc/1c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




Bc/3c-2c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 250




Bc-Ac/2c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 250

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 421 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
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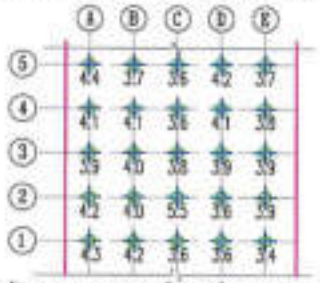
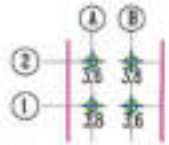
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



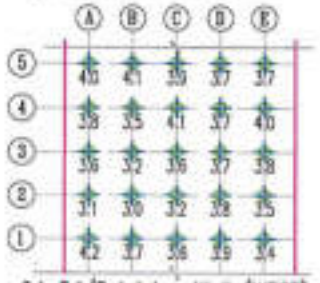

1d-2d/Retaining Wall (WEST) - Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |



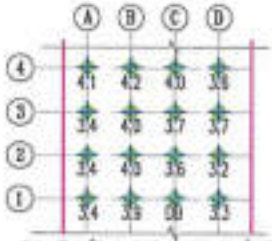

1d-2d/Retaining Wall - UnDisturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |



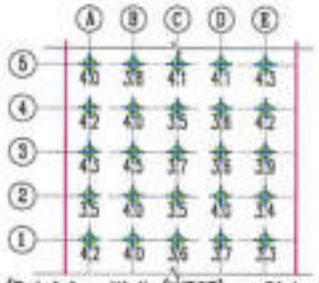

6d-5d/Retaining Wall (WEST)

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |



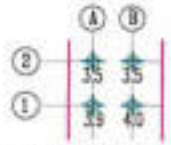

2d-3d/Retaining Wall (WEST)

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |



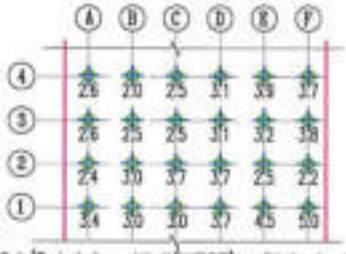

Kd-Hd/Retaining Wall (WEST) - Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |



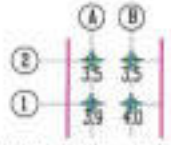

Kd-Hd/Retaining Wall - UnDisturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |




Ad-Gd/Retaining Wall(WEST)- Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |




Ad-Gd/Retaining Wall - UnDisturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. S
Technical Manager - NDT & Forensics

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. ALL FIGURES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(NS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

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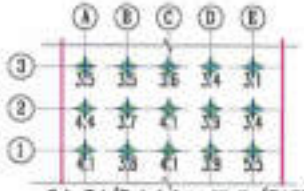
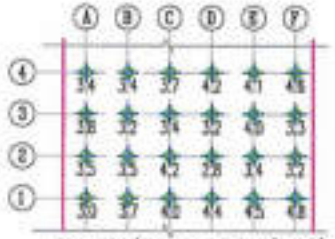
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



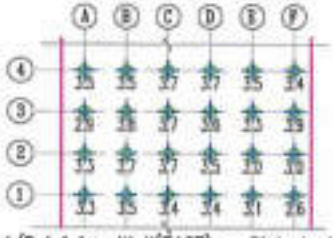

2d-3d/Retaining Wall (EAST)

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



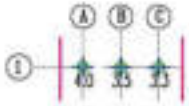

9d-10d/Retaining Wall(EAST)

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



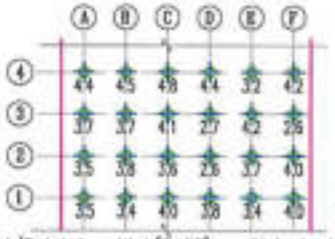

4d-5d/Retaining Wall(EAST) - Disturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



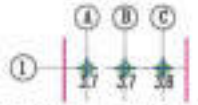

4d-5d/Retaining Wall - UnDisturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




7d-9d/Retaining Wall(EAST) - Disturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

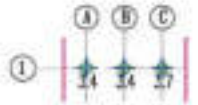



7d-9d/Retaining Wall - UnDisturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

AG-6d/Retaining Wall(EAST) - Disturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300




4d-5d/Retaining Wall - UnDisturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.5 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *NG FURNISHED BY CLIENT]
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. +/- INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

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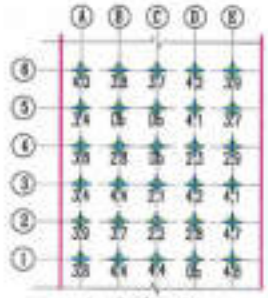
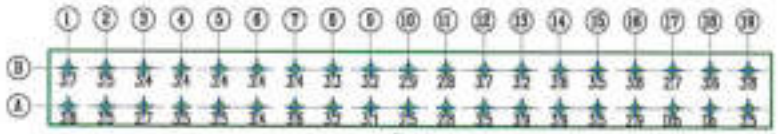
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



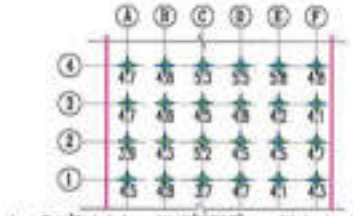
Ag-7d/Sd-9d

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



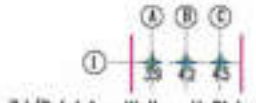
Ag/7d

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



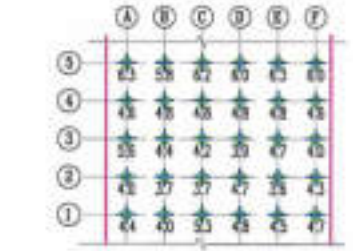
Ag-7d/Retaining Wall(WEST) - Disturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



Ag-7d/Retaining Wall - UnDisturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300



8d-9d/Retaining Wall(WEST) - Disturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

8d-9d/Retaining Wall - UnDisturbed Area

MEMBER : RC RETAINING WALL
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (4) - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. PCC FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

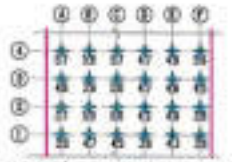
PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

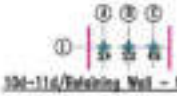
CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 56 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

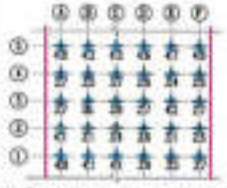
# TEST REPORT



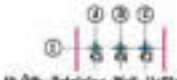
10d-11d/Retaining Wall - Disturbed Area



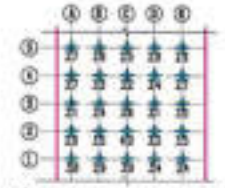
10d-11d/Retaining Wall - UnDisturbed Area



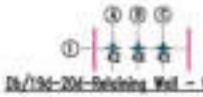
Ab/Wb-Retaining Wall - Disturbed Area



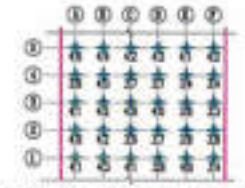
Ab/Wb-Retaining Wall-UnDisturbed Area



Db/19d-20d-Retaining Wall-Disturbed Area

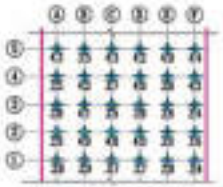


Db/19d-20d-Retaining Wall - UnDisturbed Area

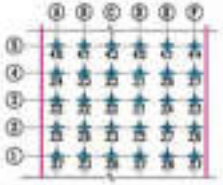


Dd/21d-22d-Retaining Wall - Disturbed Area

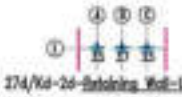
Dd/21d-22d-Retaining Wall - UnDisturbed Area



Dd/22d-23d-Retaining Wall



27d/Kd-2d-Retaining Wall(WEST) - Disturbed Area



27d/Kd-2d-Retaining Wall-UnDisturbed Area

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & SHM

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. (C)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

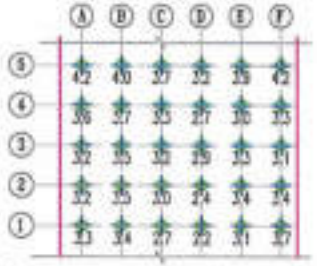
PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.
[illegible]

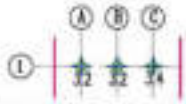
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 57 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



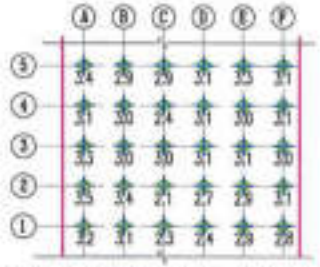

19d/20d-Retaining Wall(WEST) - Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |




19d/20d-Retaining Wall-UnDisturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |

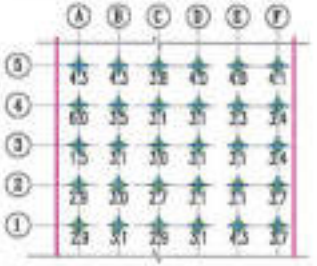



Ab/Mb-Retaining Wall - Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |

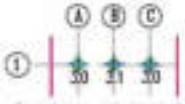
Ab/Mb-Retaining Wall-UnDisturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |



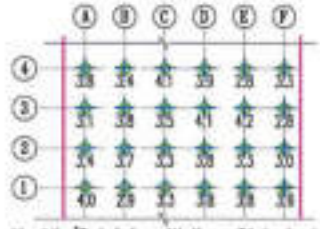

Ab/Mb-Retaining Wall(WEST) - Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |




Ab/Mb-Retaining Wall-UnDisturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |




Ab-Mb/Retaining Wall - Disturbed Area

| | |
|---|---|
| MEMBER | : RC RETAINING WALL |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : BASEMENT (TOWER-C) |
| PATH LENGTH | : 300 |

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
(AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 [Amendment-November 2019])

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.2 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. IC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING D1 TO D5 FOR MEMBER/GRID IDENTIFICATION.

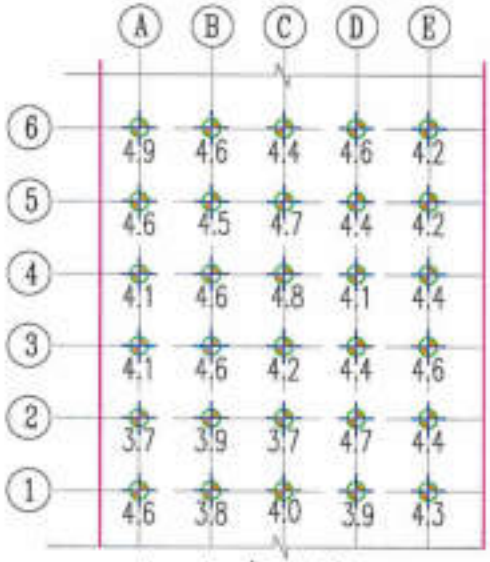
PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

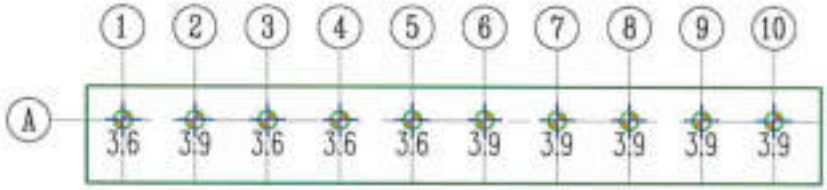
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 58 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



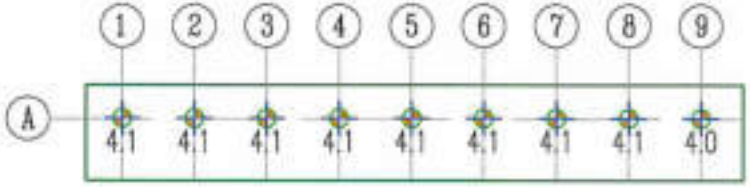

Ac-Bc/9c-10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300




Bc/10c-11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : BASEMENT (TOWER-C)
PATH LENGTH : 230




Bc/10c-11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 230

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 [Amendment-November 2019])

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.6 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

DATE OF RECEIPT -27/12/2022
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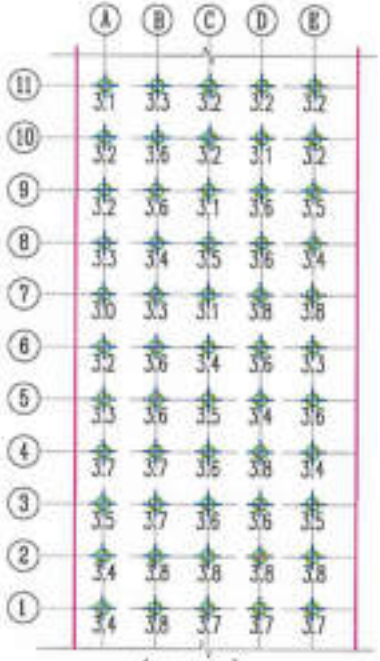
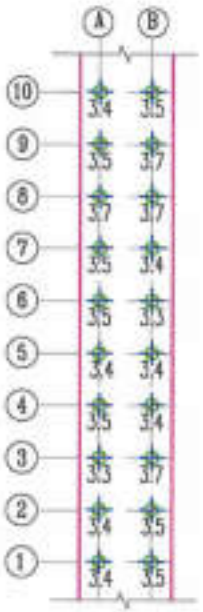
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



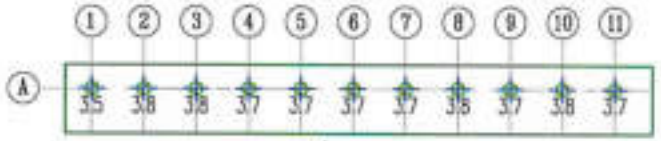

(Lc-10c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 330



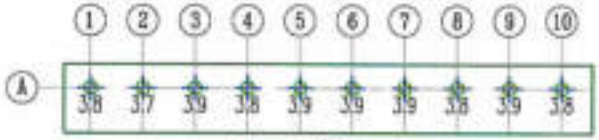

Lc/12c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 750




Mc-Lc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 230




Mc-Lc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 230

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019))

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & QC

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. ... VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
UPVT RESULTS

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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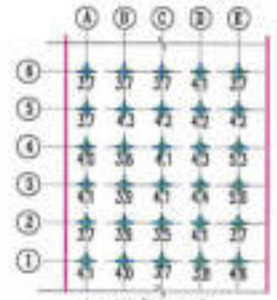
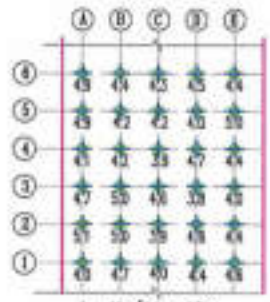
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



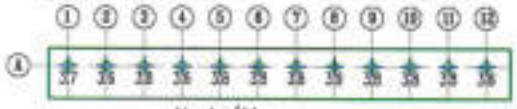
Lc-Kc/11c-10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300



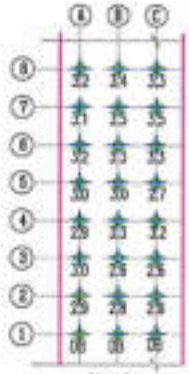
Lc-Kc/11c-12c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300



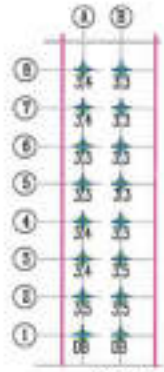
Mc-Lc/11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 240



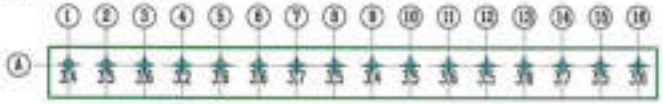
Hc-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M50
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300



Bc-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M50
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 730



Ec-2c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 220

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & R

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. XXX - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING S1 TO S5 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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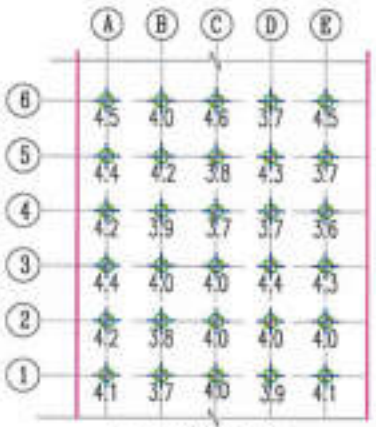
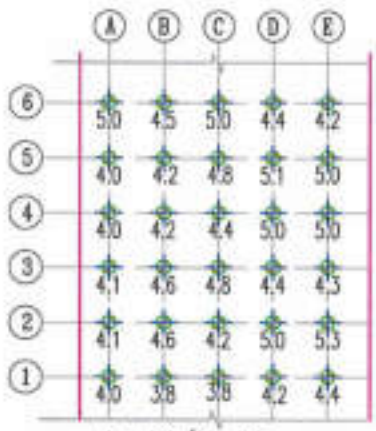
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



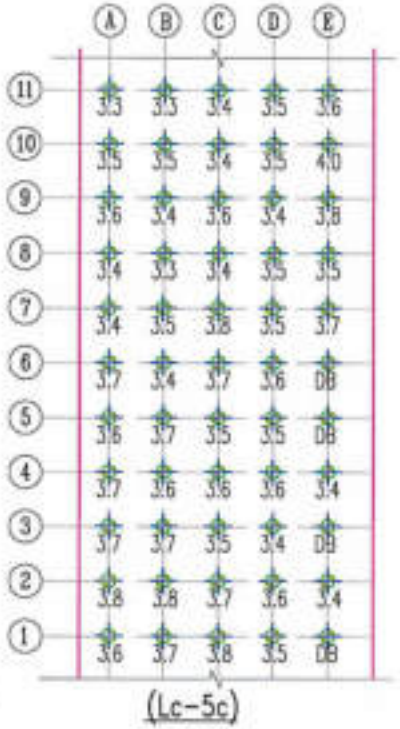

Mc-Lc/8c-10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR
PATH LENGTH : 300




Lc-Kc/3c-5c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300




(Lc-5c)

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 440

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

AVINASH. J
Technical Manager

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.7 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *AS FURNISHED BY CLIENT.
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

DATE OF RECEIPT -27/12/2022
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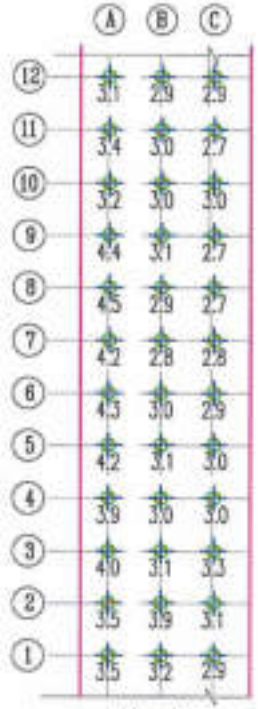
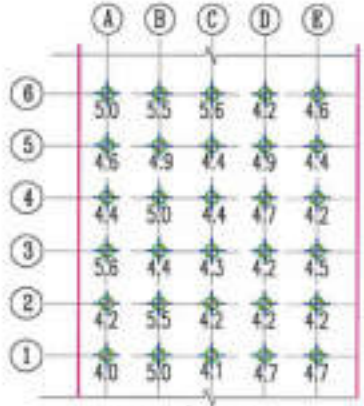
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



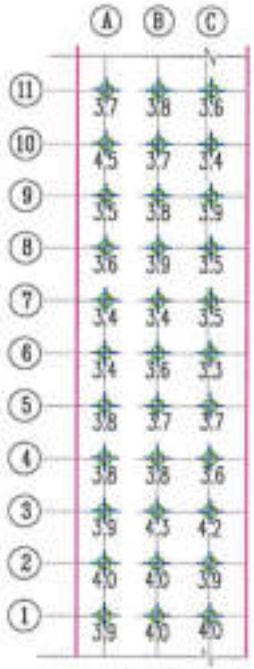

Hc-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300




Ec-Cc/1c-2c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR
PATH LENGTH : 300




Cc-3c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 330

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

ENGINEER: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
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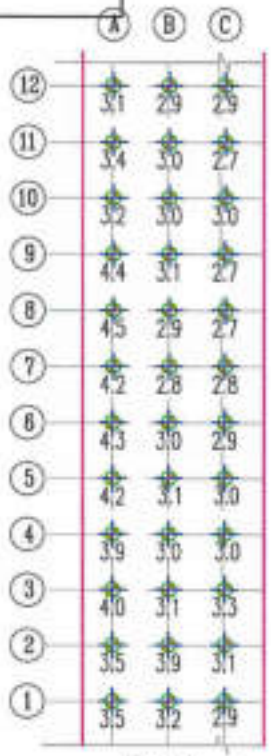
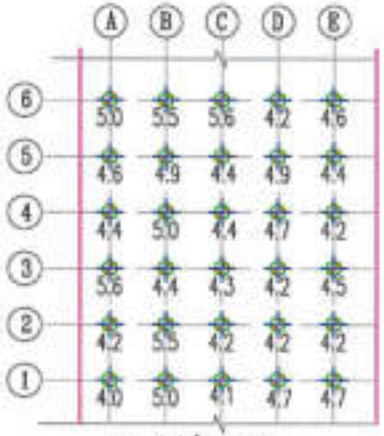
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



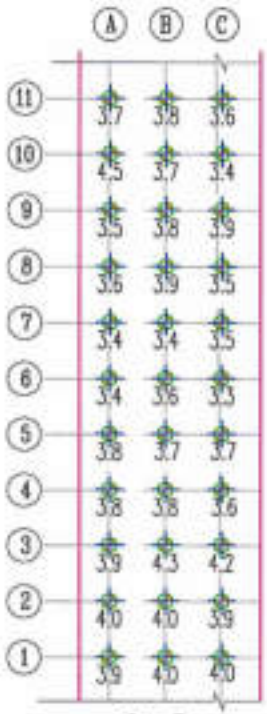

Hc-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 300




Ec-Cc/1c-2c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR
PATH LENGTH : 300




Cc-3c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 330

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [ ] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(DP)
5. NO. FORWARD OF CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. NS-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

AVINASH
Technical Manager

DATE OF RECEIPT -27/12/2022
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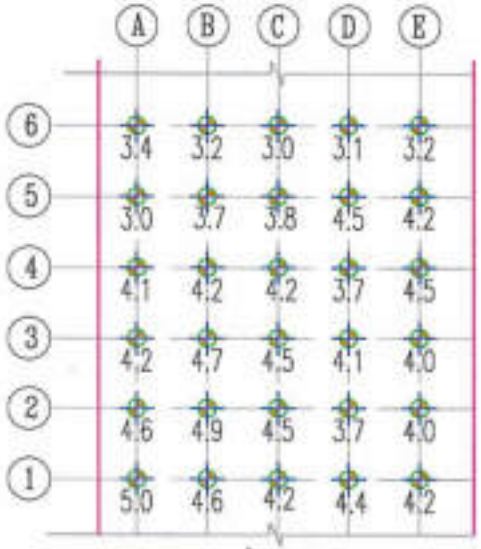
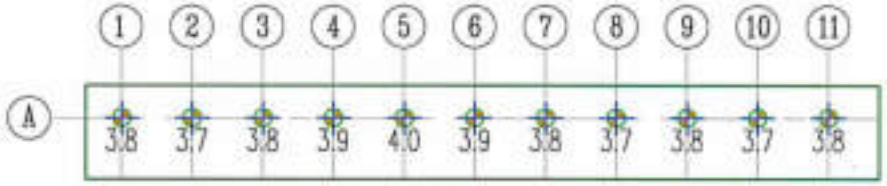
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



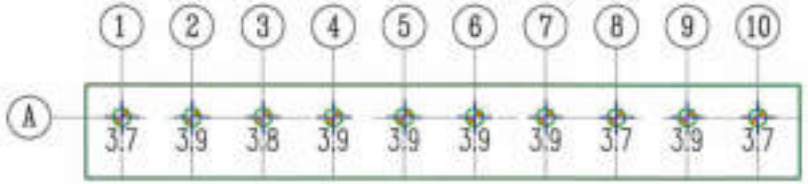

Bc-Cc/10c-11c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : GROUND FLOOR
PATH LENGTH : 300




Bc-Ac/8c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 230




bc/10c-11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : GROUND FLOOR (TOWER-C)
PATH LENGTH : 230

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
**UPVT RESULTS**

CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

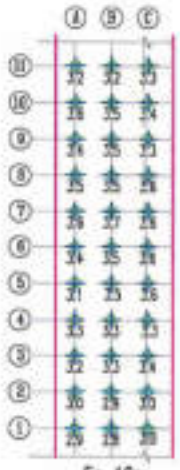
NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP.)
5. [illegible] AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. (x)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING D1 TO D5 FOR MEMBER/GRID IDENTIFICATION.

AVINASH J
Technical Manager

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023

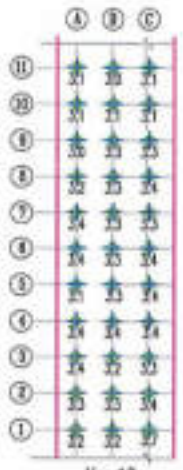
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



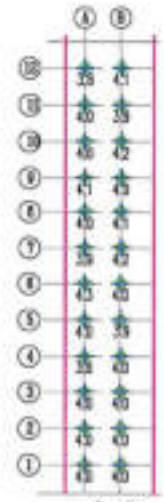
Ec-10c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 380



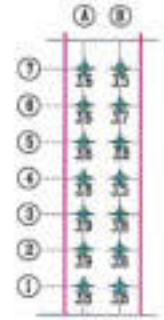
Hc-10c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 390



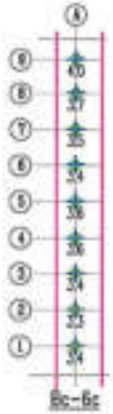
Cc-9c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 660



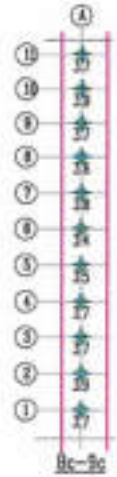
Kc-5c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 29TH FLOOR (TOWER-C)
PATH LENGTH : 640



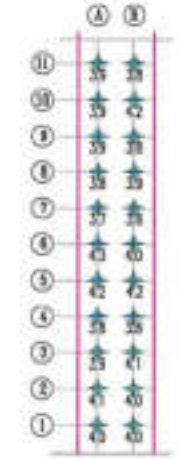
Bc-6c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : SEMI DIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 150*150



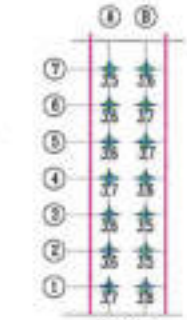
Bc-9c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : SEMI DIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 150*150



Cc-6c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 29TH FLOOR (TOWER-C)
PATH LENGTH : 630



Kc-8c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 29TH FLOOR (TOWER-C)
PATH LENGTH : 640

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST
[AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH.
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (XX) - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec(TYP).
5. *(NS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. (x)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
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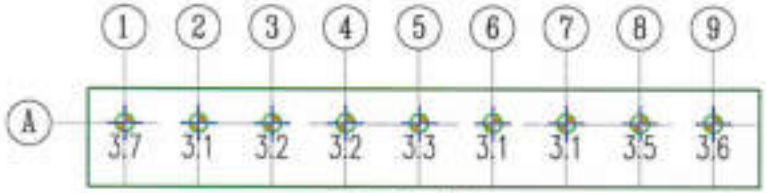
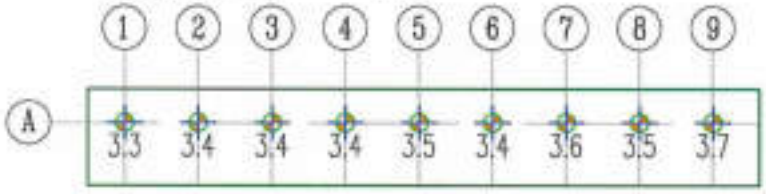
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



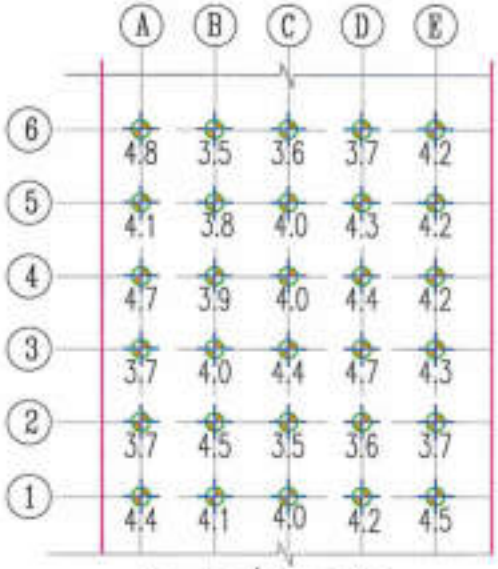

3c-5c/Cc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 29TH FLOOR (TOWER-C)
PATH LENGTH : 230




9c-10c/Cc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 29TH FLOOR (TOWER-C)
PATH LENGTH : 230




Ec-Hc/9c-10c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH.
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [ ] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. (Z)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

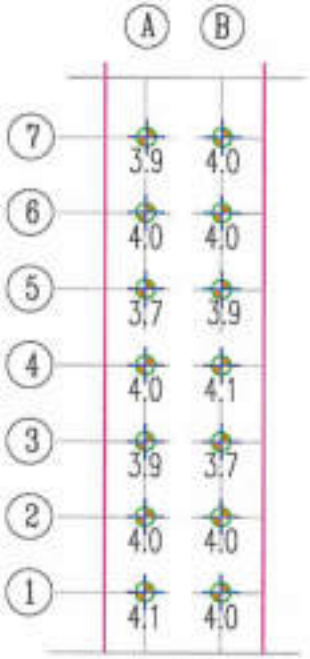
PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

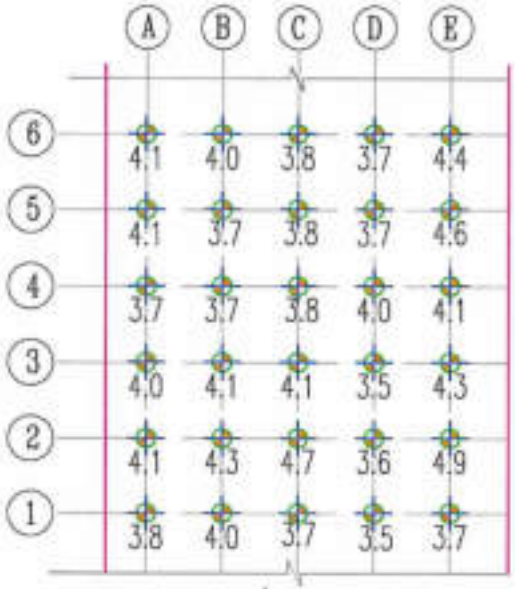
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 68 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



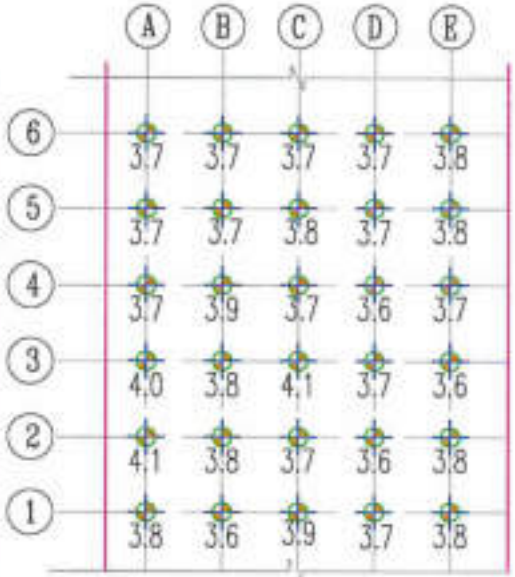

Lc-5c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : SEMI DIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 150*150




Bc-Cc/11c-12c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 300




Kc-Lc/5c-8c

MEMBER : RC SLAB
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 29TH FLOOR
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH.
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (@ & VALUES INDICATES VELOCITY OF PULSE IN km/sec(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. (C)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING S1 TO S5 FOR MEMBER/GRID IDENTIFICATION.

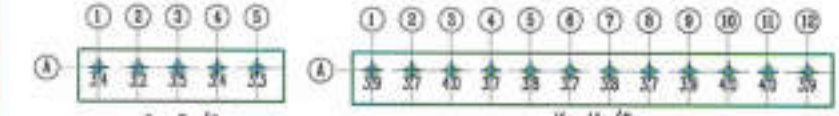
PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

ENGAGED: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 69 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



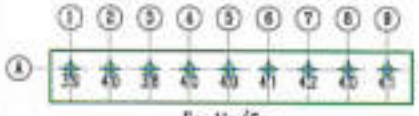

9c-5c/Cc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 230




Kc-Hc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 340

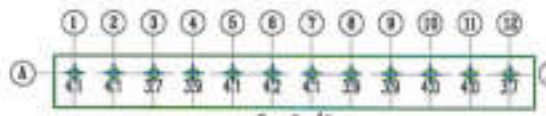



Ec-Hc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 340

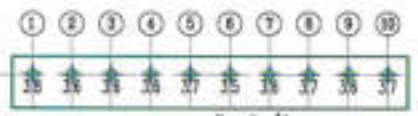
9c-5c/Kc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 240



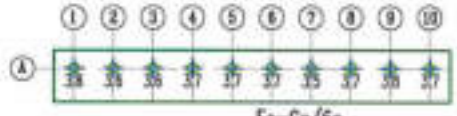

Ec-Cc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 340




Ec-Cc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 340




Ec-Cc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 28TH FLOOR (TOWER-C)
PATH LENGTH : 340

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & SHM

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.2 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

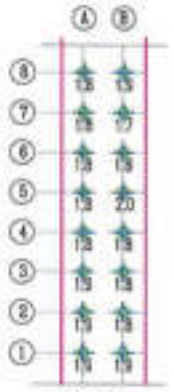
PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

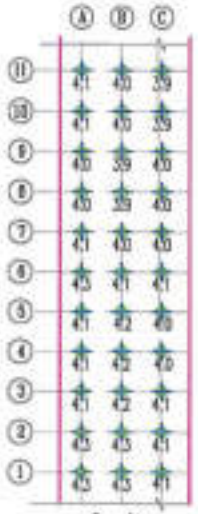
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 70 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



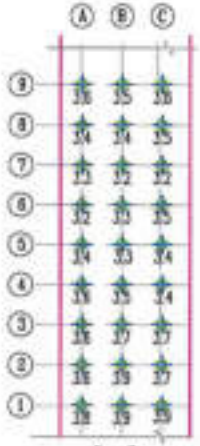

Cc-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 340



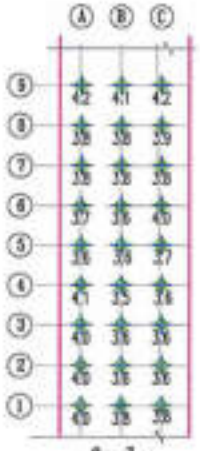

Bc-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 720



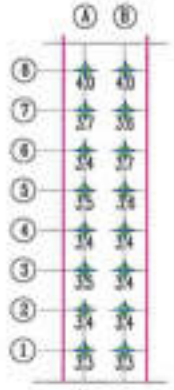

Cc-3c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 340



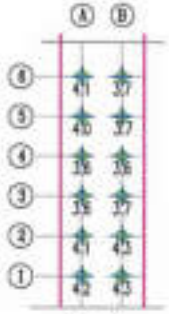

8c-3c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 350



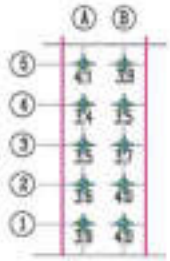

Cc-5c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 670




Ac-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 300




Bc-6c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 300

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (4.0) - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(UPV).
5. *(NS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. (C)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

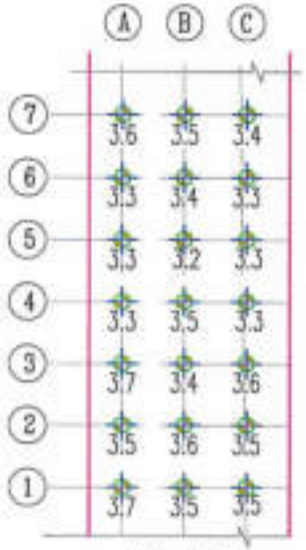
TITLE
**UPVT RESULTS**

CONSULTANT
BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023

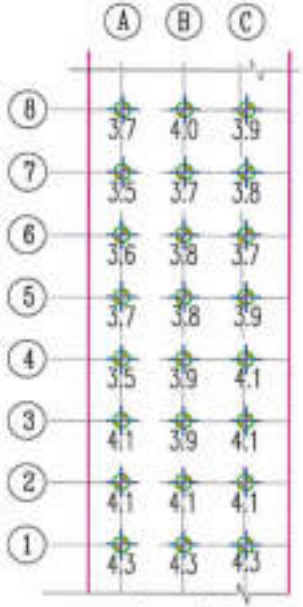
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



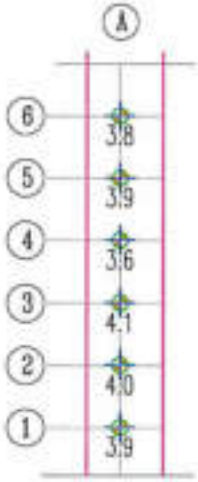

Kc-10c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 360



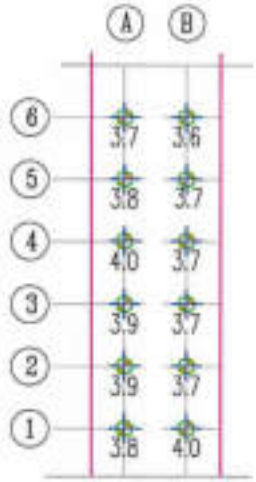

Lc-11c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 730




Cc-1c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 300




Ac-2c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 300

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & SHM

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [illegible] VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. NC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

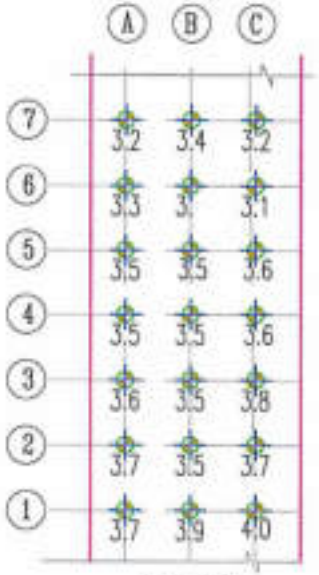
PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

ORGANISATION: BUREAU VERITAS (INDIA) PVT. LTD.

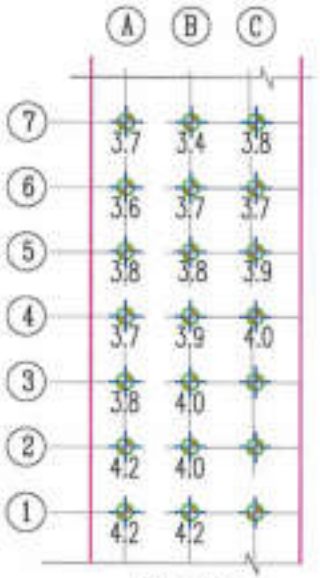
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 72 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



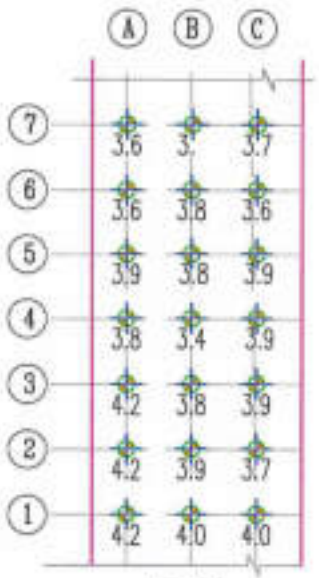

Lc-10c

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : 27TH FLOOR |
| PATH LENGTH | : 350 |



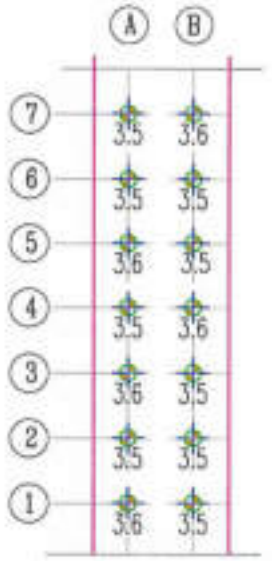

Kc-11c

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : 27TH FLOOR |
| PATH LENGTH | : 740 |




Lc-2c

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : DIRECT |
| FLOOR | : 27TH FLOOR |
| PATH LENGTH | : 750 |




Kc-6c

| | |
|---|---|
| MEMBER | : RC COLUMN |
| GRADE OF CONCRETE | : M30 |
| METHOD OF TEST | : INDIRECT |
| FLOOR | : 27TH FLOOR |
| PATH LENGTH | : 670 |

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 [Amendment-November 2019]] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

PROJECT
STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE
**UPVT RESULTS**

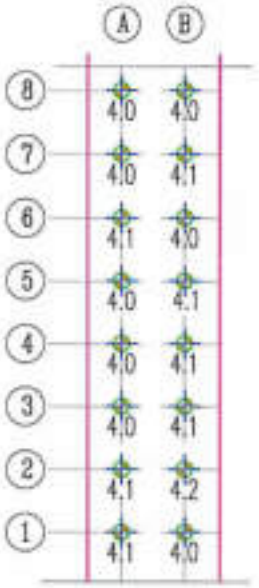
CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.

AVINASH.
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [ ] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *AS FURNISHED BY CLIENT.
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. UC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

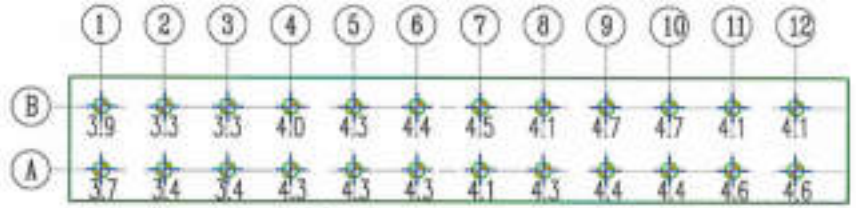
DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023
PAGE NO. 73 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




Cc-11c

MEMBER : RC COLUMN
GRADE OF CONCRETE : M30
METHOD OF TEST : INDIRECT
FLOOR : 27TH FLOOR
PATH LENGTH : 750




Bc/10c-11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 280

3c/Bc-Cc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 240

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT &

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. [ ] - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

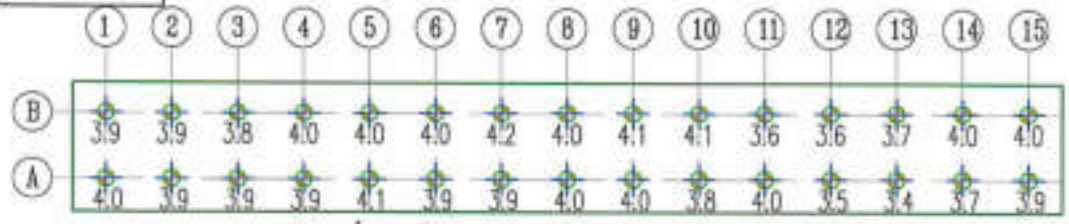
TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
ULR NO - TC600623200000118F
DATE OF SUBMISSION - 25TH APRIL 2023

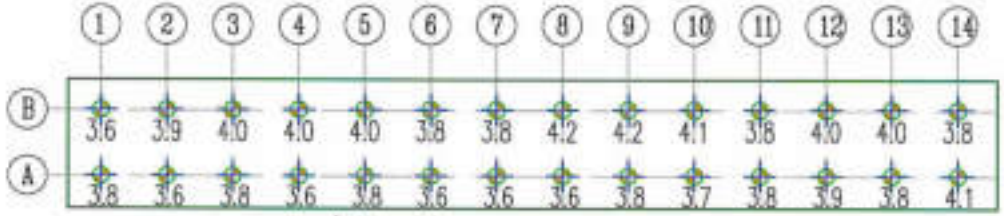
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




11c/Ac-Bc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 250




Kc/10c-11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 240

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT & SHM

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. ALL VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *AS FURNISHED BY CLIENT
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. *-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
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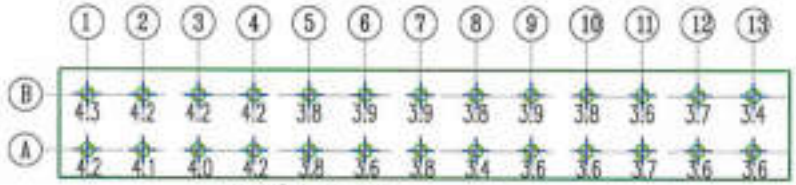
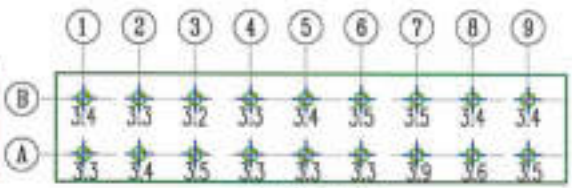
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




Lc/10c-11c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 240




10c/Bc-Cc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 250

10c/Kc-Lc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 240

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

AVINASH. J
Technical Manager - NDT

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (3.9) - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. NC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING S1 TO S5 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
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DATE OF SUBMISSION - 25TH APRIL 2023
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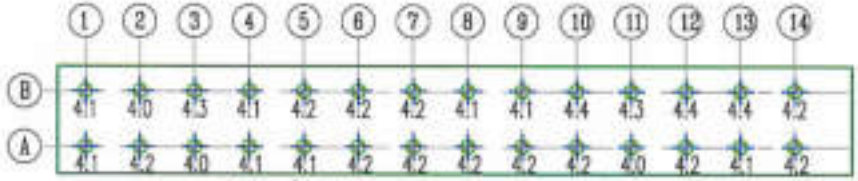
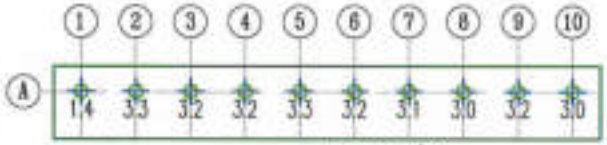
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT



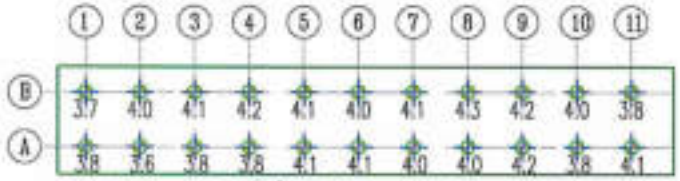

11c/Lc-Mc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 230



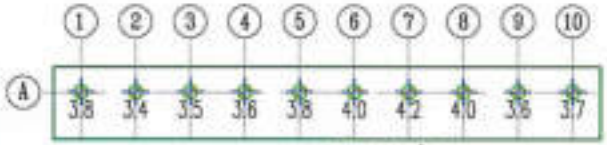

Ec-Cc/6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 26TH FLOOR (TOWER-C)
PATH LENGTH : 340




3c/Lc-Kc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 240




2c-3c/Cc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 26TH FLOOR (TOWER-C)
PATH LENGTH : 240

AVINASH. J
Technical Manager - NDT

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2018)] | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. (XXX) VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. LC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: **UPVT RESULTS**

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

DATE OF RECEIPT -27/12/2022
CONTRACT NO - 17671143/4
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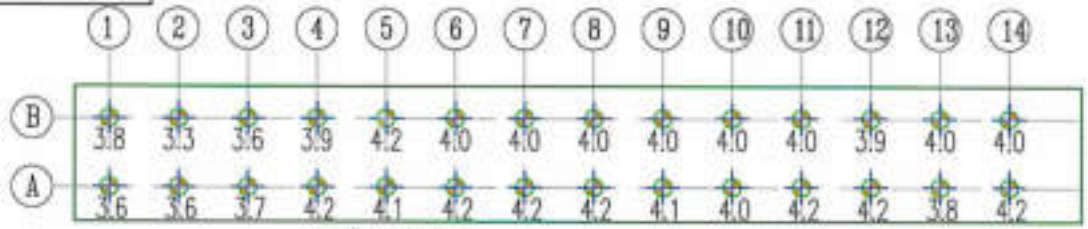
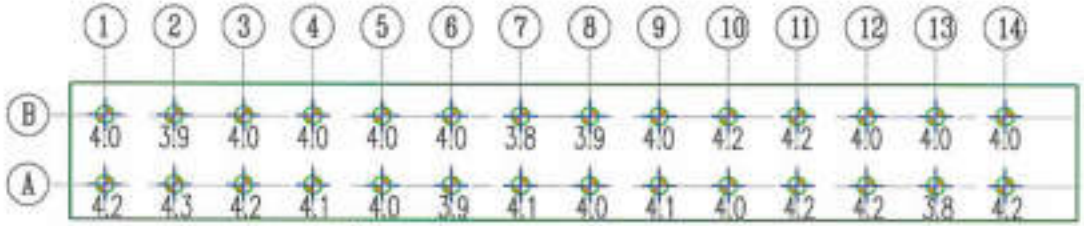
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




2c/Lc-Mc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 230




2c/Lc-Mc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 230

AVINASH. J
Technical Manager - NDT & R

CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST [AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)]

| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
|---|---|
| Below 3.75 | Doubtful* |
| 3.75 to 4.50 | Good |
| Above 4.50 | Excellent |

* IN CASE OF "DOUBTFUL" QUALITY, IT MAY BE NECESSARY TO CARRY OUT FURTHER TESTING.

NOTES:
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2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 3.8 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(NS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS.
7. (C)-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

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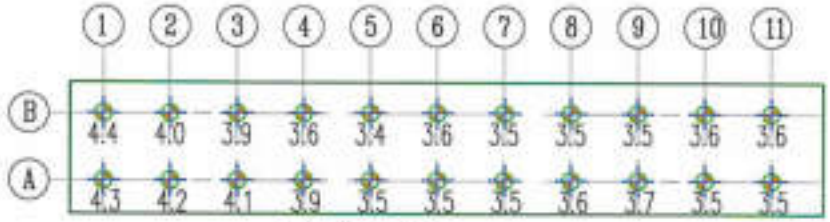
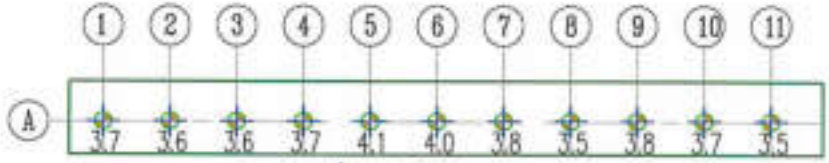
PAGE NO. 78 OF 78
M/S. ARMY WELFARE HOUSING ORGANIZATION
C/O PRASANNA VIHAR, MARINE DRIVE,
OPP. HIGH COURT, KOCHI - 682 031.

# TEST REPORT




Bc/3c-6c

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 240




2c/Ac-Bc

MEMBER : RC BEAM
GRADE OF CONCRETE : M30
METHOD OF TEST : DIRECT
FLOOR : 27TH FLOOR (TOWER-C)
PATH LENGTH : 230

AVINASH. J
Technical Manager - NDT & RR

| CONCRETE QUALITY GRADING CHART FOR ULTRASONIC PULSE VELOCITY TEST (AS PER TABLE-1 OF IS:516 (PART 5/SEC 1) : 2018 (Amendment-November 2019)) | |
|---|---|
| PULSE VELOCITY (km/sec) | CONCRETE QUALITY GRADING |
| Below 3.75 | Doubtful* |
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PROJECT: STRUCTURAL STABILITY ASSESSMENT OF RESIDENTIAL ARMY TOWERS OF ARMY WELFARE HOUSING ORGANIZATION, KOCHI KERALA

TITLE: UPVT RESULTS

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

NOTES:
1. ALL DIMENSIONS ARE IN mm.
2. DO NOT SCALE THE DRAWING.
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. 4.0 - VALUES INDICATES VELOCITY OF PULSE IN Km/Sec.(TYP).
5. *(AS FURNISHED BY CLIENT)
6. AGE OF CONCRETE - MORE THAN 28 DAYS
7. IC-INCONSISTENT READINGS DUE TO PRESENCE OF CRACKS/VOIDS IN CONCRETE.
8. REFER SKETCH DRAWING 01 TO 05 FOR MEMBER/GRID IDENTIFICATION.

**Bureau Veritas India Pvt. Ltd.**
No.1030, 13th Cross, Attimabbe Road,
Banashankari 2nd Stage, Bangalore -560070
Ph: 080-26980200, Mob: +918050118118
Mail Id : ndt.bangalore@bureauveritas.com

# TEST REPORT

Contract No – 17671143/5
Date of Receipt – 27/12/2022
M/s. Army Welfare Housing Organization
C/o Prasanna Vihar, Marine Drive,
Opp. High Court, Kochi – 682 031.

ULR No – TC600623200000119F
Date of submission – 25th April 2023


## RESULTS OF REBOUND HAMMER TEST

| | | |
|---|---|---|
| **Project** | : | Structural Stability Assessment Existing Chanderkunj Army Residential Tower-C of Army Welfare Housing Organization, Kochi, Kerala. |
| **Members tested** | : | RC Slab & RC Shear wall. |
| **Period of test** | : | 18th January 2023 to 23rd February 2023 |
| **Grade of concrete** | : | M30* |
| **Age of concrete** | : | More than 28 days* |
| **Test instrument** | : | Schmidt Hammer |
| **Make** | : | M/s. Proceq, Switzerland |
| **Position of hammer** | : | Vertically upwards |
| **Technical references** | : | 1. Indian Standard IS: 516(Part 5/Sec 1):2020<br>2. Instrument manual furnished by M/s. Proceq, Switzerland |

NDT
Building Materials
Reinforced Concrete Structure

| Sl. No. | Floor / Member Identification# | Grid Identification# | Average Rebound Number+ | Remarks |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| **Basement Floor – Tower B & Tower C** | | | | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 1 | **RC Slab** | (Ab-Bb/9b-10b) | 52 | |
| 2 | | (2b-Mb/8b-10b) | 52 | |
| 3 | | 2b/1b-2b | 50 | |
| 4 | | Gd-Jd/24d-25d | 54 | |
| 5 | | Gd-Dd/21d-22d | 56 | |
| 6 | | Gd-Jd/19d-20d | 56 | |
| 7 | | Gd-Dd/16d-15d | 56 | |
| 8 | | Kd-Ld/Mb-15d | 54 | |
| 9 | | Kd-Ld/16d-15d | 54 | |
| 10 | | Lc-Kc/10c-11c | 34 | |
| 11 | | Lc-Kc/12c-11c | 34 | |

AVINASH. J
Technical Manager - NDT & RR

*Indicates information supplied by the customer for which the laboratory has no control. Sampling not done by laboratory, results relate to the sample tested only.
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**Bureau Veritas India Pvt. Ltd.**
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Banashankari 2nd Stage, Bangalore -560070
Ph: 080-26980200, Mob: +918050118118
Mail Id : ndt.bangalore@bureauveritas.com

Contract No – 17671143/5
Date of Receipt – 27/12/2022

ULR No – TC600623200000119F
Date of submission – 25th April 2023



| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 12 | RC Slab | 4d-5d/Bd-Ed | 52 | Refer reference chart for estimated compressive strength range of in-situ concrete |
| 13 | | 3d-4d/Bd-Ed | 56 | |
| 14 | | 1d-2d/Hd-Jd | 56 | |
| 15 | | 6d-Ac/Dd-Gd | 56 | |
| 16 | | Pd-Nd/6d-Ac | 54 | |
| 17 | | Nd-Md/25d-27d | 52 | |
| 18 | | Jd-2d/23d-25d | 50 | |
| 19 | | 25d-27d/Jd-Gd | 54 | |
| 20 | | Jd-Ld/22d-24d | 50 | |
| 21 | | Nd-Od/16d-18d | 54 | |
| 22 | | Ab-Bb/1b-2b | 54 | |
| 23 | | Cb-Eb/1b-2b | 54 | |
| 24 | | Cb-Eb/2b-3b | 54 | |
| 25 | | Cb-Db/9b-10b | 56 | |
| 26 | | 11b-12b/Ab-Bb | 54 | |
| 27 | | 11b-12b/Bb-Cb | 58 | |
| 28 | | 11b-12b/cb-Eb | 58 | |
| 29 | | 11b-12b/Eb-Hb | 56 | |
| 30 | | 11b-12b/Gb-Kb | 52 | |
| 31 | | 11b-12b/Kb-Lb | 52 | |
| 32 | | 11b-12b/Mb-Lb | 58 | |
| 33 | | 9b-10b/Ab-Bb | 56 | |
| 34 | | 5b-9b/Ab-Bb | 58 | |
| 35 | | 2b-3b/Ab-Bb | 60 | |

AVINASH. S
Technical Manager - NDT & RR

*Indicates information supplied by the customer for which the laboratory has no control. Sampling not done by laboratory, results relate to the sample tested only.
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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 36 | RC Slab | 1b-2b'/Kb-Hb | 56 | Refer reference chart for estimated compressive strength range of in-situ concrete |
| 37 | | 1b-2b/Lb-Kb | 56 | |
| 38 | | 3b-4b/Lb-Mb | 48 | |
| 39 | | 5b-9b/Lb-Mb | 60 | |
| 40 | | 8b-10b/Lb-Mb | 56 | |
| 41 | | 1b-2b'/Kb-Hb | 56 | |
| 42 | | 1b-2b/Lb-Kb | 56 | |
| 43 | | 3b-4b/Lb-Mb | 48 | |
| 44 | | 5b-9b/Lb-Mb | 60 | |
| 45 | | 8b-10b/Lb-Mb | 56 | |
| 46 | | Lc-Mc/3c-4c | 58 | |
| 47 | | Lc-Mc/2c-3c | 52 | |
| 48 | | Lc-Mc/8c-6c | 54 | |
| 49 | | Lc-Mc/9c-10c | 56 | |
| 50 | | Lc-Kc/9c-10c | 56 | |
| 51 | | Kc-Lc/1c-2c | 56 | |
| 52 | | Ec-Hc/1c-2c | 56 | |
| 53 | | Ac-Bc/2c-3c | 56 | |
| 54 | | 10c-11c/Lc-Mc | 56 | |
| 55 | | 10c-11c/Kc-Lc | 56 | |
| 56 | | 11c-12c/Kc-Lc | 56 | |
| 57 | | 10c-11c/Cc-Ec | 56 | |
| 58 | | 10c-11c/Bc-Cc | 54 | |
| 59 | | 9c-10c/Bc-Cc | 56 | |

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| 60 | **RC Slab** | 3c-4c/Bc-Cc | 56 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 61 | | 9c-10c/Ac-Bc | 52 | |
| 62 | | 2c-3c/Bc-Cc | 54 | |
| 63 | | 2c-3c/Bc-Cc | 52 | |
| **Ground Floor** | | | | |
| 64 | **RC Slab** | Mc-Lc/8c-10c | 32 | |
| 65 | | Lc-Kc/3c-5c | 32 | |
| 66 | | Kc-Lc/10c-11c | 32 | |
| 67 | | Lc-Kc/11c-12c | 30 | |
| 68 | | Ec-Cc/1c-2c | 32 | |
| 69 | | Bc-Cc/10c-11c | 30 | |
| 70 | | Ac-Bc/9c-10c | 40 | |
| **First Floor** | | | | |
| 71 | **RC Slab** | 12c-11c/Hc-Lc | 42 | |
| 72 | | Hc-Kc/10c-11c | 40 | |
| 73 | | Dc-Cc/4c-5c | 42 | |

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| 1 | 2 | 3 | 4 | 5 |
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| **Second Floor** | | | | |
| 74 | **RC Slab** | Hc-Kc/10c-11c | 40 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 75 | | Dc-Cc/4c-5c | 42 | |
| 76 | | Ac-Bc/11c-12c | 38 | |
| 77 | | Dc/5c-8c | 40 | |
| 78 | | Ac-Bc/1c-2c | 32 | |
| 79 | | Mc-Lc/1c | 34 | |
| 80 | | Kc-Hc/2c-3c | 36 | |
| 81 | | Mc-Lc/11c-12c | 40 | |
| **Third Floor** | | | | |
| 82 | **RC Slab** | Ac-Bc/6c-8c | 42 | |
| 83 | | Kc-Gc/3c-4c | 42 | |
| 84 | | Mc-Lc/1c-2c | 42 | |
| 85 | | Kc-Lc/10c-11c | 40 | |
| 86 | | Ac-Bc/11c-12c | 38 | |
| **Fourth Floor** | | | | |
| 87 | **RC Slab** | Lc-Kc/3c-4c | 38 | |
| 88 | | Kc-Hc/2c-3c | 38 | |
| 89 | | Ec-Cc/10c-11c | 40 | |
| 90 | | Ec-Cc/2c-3c | 40 | |
| 91 | | Kc-Hc/2c-3c | 38 | |
| 92 | | Lc-Kc/11c-12c | 38 | |
| 93 | | Mc-Lc/10c-11c | 38 | |
| 94 | | Dc-Cc/5c-9c | 42 | |

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| **Fifth Floor** | | | | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 95 | **RC Slab** | Ac-Bc/11c-12c | 34 | |
| 96 | | Cc-Bc/6c-8c | 32 | |
| 97 | | Hc-Kc/1c-2c | 38 | |
| 98 | | Mc-Lc/2c-3c | 38 | |
| 99 | | Lc-Kc/8c-6c | 40 | |
| 100 | | Ac-Bc/1c-2c | 38 | |
| 101 | | Lc-Mc/10c-11c | 36 | |
| **Sixth Floor** | | | | |
| 102 | **RC Slab** | Cc-Ec/11c-12c | 34 | |
| 103 | | Cc-Ec/1c-2c | 38 | |
| 104 | | Kc-Hc/1c-2c | 38 | |
| 105 | | Bc-Cc/6c-8c | 46 | |
| **Seventh Floor** | | | | |
| 106 | **RC Slab** | Ac-Bc/11c-12c | 32 | |
| 107 | | Ac-Bc/2c-3c | 34 | |
| 108 | | Lc-Kc/1c-2c | 34 | |
| 109 | | Lc-Kc/10c-11c | 38 | |
| **Eight Floor** | | | | |
| 110 | **RC Slab** | Mc-Lc/2c-3c | 36 | |
| 111 | | Bc-Cc/1c-2c | 40 | |
| 112 | | Kc-Lc/10c-11c | 40 | |
| 113 | | Mc-Lc/1c-2c | 36 | |
| 114 | | Hc-Kc/2c-3c | 34 | |

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|---|---|---|---|---|
| **Nineth Floor** | | | | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 115 | **RC Slab** | Cc-Ec/10c-11c | 32 | |
| 116 | | Bc-Cc/2c-3c | 32 | |
| 117 | | Mc-Lc/2c-3c | 34 | |
| **Tenth Floor** | | | | |
| 118 | **RC Slab** | Cc-Bc/11c | 38 | |
| 119 | | Mc-Lc/1c-2c | 38 | |
| 120 | | Bc-Ac/3c-5c | 38 | |
| 121 | | Kc-Lc/11c-12c | 40 | |
| **Eleventh Floor** | | | | |
| 122 | **RC Slab** | Ac-Bc/11c-12c | 36 | |
| 123 | | Bc-Cc/5c-3c | 36 | |
| 124 | | Hc-Kc/11c-12c | 34 | |
| 125 | | Mc-Lc/1c-2c | 36 | |
| 126 | | Mc-Lc/11c-12c | 42 | |
| **Twelfth Floor** | | | | |
| 127 | **RC Slab** | Lc-Kc/2c-3c | 36 | |
| 128 | | Kc-Lc/11c-12c | 34 | |
| 129 | | Ac-Bc/1c-2c | 34 | |
| 130 | | Ac-Bc/11c-12c | 34 | |
| **Thirteenth Floor** | | | | |
| 131 | **RC Slab** | Ac-Bc/10c-11c | 42 | |
| 132 | | Ac-Bc/1c-2c | 42 | |
| 133 | | Lc-Kc/11c-12c | 44 | |

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| 134 | **RC Slab** | Kc-Hc/2c-3c | 30 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 135 | | Lc-Mc/1c-2c | 30 | |
| 136 | | Hc-Kc/2c | 32 | |
| **Fourteenth Floor** | | | | |
| 137 | **RC Slab** | Hc-Kc/1c-2c | 36 | |
| 138 | | Ac-Bc/1c-2c | 32 | |
| 139 | | Mc-Lc/10c-11c | 38 | |
| 140 | | Ec-Cc/10c-11c | 32 | |
| **Fifteenth Floor** | | | | |
| 141 | **RC Slab** | Lc-Kc/11c-12c | 32 | |
| 142 | | Bc-Cc/11c-12c | 38 | |
| **Sixteenth Floor** | | | | |
| 143 | **RC Slab** | Ac-Bc/11c-12c | 34 | |
| 144 | | Bc-Cc/1c-2c | 34 | |
| 145 | | Lc-Mc/1c-2c | 34 | |
| 146 | | Lc-Kc/5c-8c | 38 | |
| 147 | | Ec-Hc/11c-12c | 36 | |
| **Seventeenth Floor** | | | | |
| 148 | **RC Slab** | Ac-Bc/1c-2c | 42 | |
| 149 | | Kc-Lc/2c-3c | 30 | |
| 150 | | Lc-Mc/10c-11c | 36 | |
| 151 | | Bc-Cc/11c-12c | 36 | |
| 152 | | Ac-Bc/11c-12c | 38 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Eighteenth Floor** | | | | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 153 | **RC Slab** | Bc-Cc/1c-2c | 38 | |
| 154 | | Lc-Mc/11c-12c | 40 | |
| 155 | | Ac-Bc/10c-11c | 32 | |
| 156 | | Bc-Cc/11c-12c | 32 | |
| 157 | | Bc-Cc/6c-9c | 30 | |
| 158 | | Kc-Lc/6c-8c | 30 | |
| **Nineteenth Floor** | | | | |
| 159 | **RC Slab** | Ac-Bc/1c-2c | 38 | |
| 160 | | Lc-Kc/1c-2c | 40 | |
| 161 | | Lc-Kc/11c-12c | 42 | |
| 162 | | Mc-Lc/10c-11c | 48 | |
| **Twentieth floor** | | | | |
| 163 | **RC Slab** | Bc-Cc/1c-2c | 38 | |
| 164 | | Lc-Kc/1c-2c | 34 | |
| 165 | | Bc-Cc/5c-8c | 38 | |
| 166 | | Cc-Bc/10c-11c | 38 | |
| **Twenty-First floor** | | | | |
| 167 | | Bc-Cc/8c-10c | 36 | |
| 168 | | Ac-Bc/3c-2c | 38 | |
| 169 | | Lc-Kc/1c-2c | 40 | |
| 170 | | Bc-Cc/2c-3c | 34 | |
| **Twenty-second Floor** | | | | |
| 171 | | Ac-Bc/1c-2c | 44 | |

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| 172 | RC Slab | Lc-Kc/6c-8c | 34 | Refer reference chart for estimated compressive strength range of in-situ concrete |
| 173 | | Lc-Kc/2c-3c | 32 | |
| **Twenty-third Floor** | | | | |
| 174 | RC Slab | Lc-Mc/12c-13c | 40 | |
| 175 | | Cc-Dc/6c-8c | 36 | |
| 176 | | Ac-Bc/11c-12c | 40 | |
| 177 | | Ec-Cc/10c-11c | 38 | |
| **Twenty-fourth Floor** | | | | |
| 178 | RC Slab | Bc-Cc/2c-3c | 40 | |
| 179 | | Ac-Bc/10c-11c | 44 | |
| 180 | | Cc-Bc/10c-9c | 40 | |
| 181 | | Lc-Kc/11c-12c | 38 | |
| 182 | | Hc-Kc/11c-12c | 34 | |
| 183 | | Hc-Kc/2c-3c | 40 | |
| 184 | | Fc-Gc/10c | 32 | |
| **Twenty-fifth Floor** | | | | |
| 185 | RC Slab | Bc-Cc/1c-2c | 36 | |
| 186 | | Ec-Cc/9c-10c | 32 | |
| 187 | | Mc-Lc/1c-2c | 36 | |
| 188 | | Bc-Cc/6c-8c | 34 | |
| 189 | | Mc-Kc/11c-12c | 34 | |
| 190 | | Kc-Lc/11c-12c | 34 | |
| 191 | | Bc-Cc/6c-8c | 32 | |

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| **Twenty-Sixth Floor** | | | | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 192 | **RC Slab** | Ac-Bc/11c-12c | 36 | |
| 193 | | Ac-Bc/1c-2c | 34 | |
| 194 | | Mc-Lc/2c-3c | 32 | |
| 195 | | Mc-Lc/11c-12c | 32 | |
| 196 | | Lc-Kc/5c-8c | 30 | |
| 197 | | Bc-Cc/5c-9c | 30 | |
| **Tower C – Lift 1 - Shear Wall** | | | | |
| 198 | **Basement floor** | Fc/4c-7c | 38 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 199 | **Ground Floor** | Fc/4c-7c | 18 | |
| 200 | **3rd Floor** | Fc/4c-7c | 18 | |
| 201 | **4th Floor** | 7c/Dc-Fc | 18 | |
| 202 | **5th Floor** | Fc/4c-7c | 28 | |
| 203 | **6th Floor** | 4c/Dc-Fc | 22 | |
| 204 | **7th Floor** | 7c/Dc-Fc | 24 | |
| 205 | **8th Floor** | 4c/Dc-Fc | De-bonded | |
| 206 | **9th Floor** | Fc/4c-7c | 24 | |
| 207 | **11th Floor** | 7c/Dc-Fc | 24 | |
| 208 | **14th Floor** | Fc/4c-7c | 26 | |
| 209 | **15th Floor** | 4c/Dc-Fc | 26 | |
| 210 | | Fc/4c-7c | 24 | |
| 211 | **16th Floor** | Fc/4c-7c | 24 | |
| 212 | | 4c/Dc-Fc | De-bonded | |
| 213 | **17th Floor** | 4c/Dc-Fc | 24 | |
| 214 | | Fc/4c-7c | 24 | |
| 215 | **18th Floor** | Fc/4c-7c | 24 | |

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| 216 | | 4c/Dc-Fc | 22 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 217 | **19th Floor** | Fc/4c-7c | 20 | |
| 218 | | 4c/Dc-Fc | De-bonded | |
| 219 | **20th Floor** | 7c/Dc-Fc | 24 | |
| 220 | **21st Floor** | 7c/Dc-Fc | 24 | |
| 221 | **22nd Floor** | Fc/4c-7c | 22 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 222 | | 4c/Dc-Fc | 24 | |
| 223 | **23rd Floor** | 4c/Dc-Fc | 22 | |
| 224 | **24th Floor** | 7c/Dc-Fc | 24 | |
| 225 | | 4c/Dc-Fc | 22 | |
| 226 | **25th Floor** | 4c/Dc-Fc | 22 | |
| 227 | | Fc/4c-7c | 22 | |
| 228 | **26th Floor** | Fc/4c-7c | 24 | |
| **Tower C – Lift 2 - Shear Wall** | | | | |
| 229 | **Basement Floor** | Fc/7c-9c | 20 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 230 | **Ground Floor** | 7c/Dc-Fc | 20 | |
| 231 | **1st Floor** | 7c/Dc-Fc | De-bonded | |
| 232 | | Dc/7c-9c | De-bonded | |
| 233 | | Fc/7c-9c | 22 | |
| 234 | **2nd Floor** | 7c/Dc-Fc | De-bonded | |
| 235 | | Fc/7c-9c | De-bonded | |
| 236 | **3rd Floor** | 7c/Dc-Fc | De-bonded | |
| 237 | | Dc/7c-9c | 20 | |
| 238 | **4th Floor** | 7c/Dc-Fc | De-bonded | |
| 239 | **5th Floor** | Fc/7c-9c | De-bonded | |
| 240 | | 7c/Dc-Fc | 18 | |
| 241 | **6th Floor** | 7c/Dc-Fc | 18 | |

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Contract No – 17671143/5
Date of Receipt – 27/12/2022

ULR No – TC600623200000119F
Date of submission – 25th April 2023


| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 242 | **8th Floor** | 7c/Dc-Fc | 18 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 243 | | Dc/7c-9c | De-bonded | |
| 244 | **9th Floor** | 7c/Dc-Fc | 18 | |
| 245 | | Fc/7c-9c | De-bonded | |
| 246 | **10th Floor** | Fc/7c-9c | 18 | |
| 247 | | Dc/7c-9c | De-bonded | |
| 248 | **11th Floor** | 7c/Dc-Fc | 20 | |
| 249 | **12th Floor** | 7c/Dc-Fc | 20 | |
| 250 | **13th Floor** | 7c/Dc-Fc | 20 | |
| 251 | **14th Floor** | 7c/Dc-Fc | 20 | |
| 252 | **15th Floor** | Fc/7c-9c | 20 | |
| 253 | **16th Floor** | 7c/Dc-Fc | 20 | |
| 254 | **17th Floor** | 7c/Dc-Fc | 20 | |
| 255 | | Fc/7c-9c | 20 | |
| 256 | **18th Floor** | 7c/Dc-Fc | 20 | |
| 257 | **19th Floor** | Dc/7c-9c | 20 | |
| 258 | **20th Floor** | Fc/7c-9c | 20 | |
| 259 | **21th Floor** | Fc/7c-9c | 20 | |
| 260 | **22nd Floor** | 7c/Dc-Fc | 20 | |
| 261 | **23rd Floor** | Dc/7c-9c | 20 | |
| 262 | **24th Floor** | Fc/7c-9c | 20 | |
| 263 | **25th Floor** | 7c/Dc-Fc | 20 | |
| 264 | **26th Floor** | 7c/Dc-Fc | 20 | |
| **Tower C– Lift 3 - Shear Wall** | | | | |
| 265 | **Basement Floor** | 5c/Fc-Gc | 18 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 266 | **Ground Floor** | Gc/7c-9c | 24 | |
| 267 | **1st Floor** | Fc/7c-9c | 24 | |
| 268 | **2nd Floor** | Fc/7c-9c | 24 | |

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Technical Manager - NDT & RR

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 269 | **3rd Floor** | Fc/7c-9c | 24 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 270 | **4th Floor** | Gc/7c-9c | 24 | |
| 271 | **5th Floor** | Gc/7c-9c | 24 | |
| 272 | | 5c/Fc-Gc | 22 | |
| 273 | **6th Floor** | Gc/7c-9c | 24 | |
| 274 | | 5c/Fc-Gc | 22 | |
| 275 | **7th Floor** | Fc/7c-9c | 20 | |
| 276 | | 5c/Fc-Gc | De-bonded | |
| 277 | **8th Floor** | 5c/Fc-Gc | 20 | |
| 278 | **9th Floor** | 5c/Fc-Gc | De-bonded | |
| 279 | | Fc/7c-9c | 20 | |
| 280 | **10th Floor** | 5c/Fc-Gc | 20 | |
| 281 | | Fc/7c-9c | 20 | |
| 282 | **12th Floor** | Fc/7c-9c | 20 | |
| 283 | **14th Floor** | 5c/Fc-Gc | De-bonded | |
| 284 | | Fc/7c-9c | 18 | |
| 285 | **15th Floor** | Gc/7c-9c | 18 | |
| 286 | **16th Floor** | Gc/7c-9c | 18 | |
| 287 | **17th Floor** | 5c/Fc-Gc | 18 | |
| 288 | **19th Floor** | 5c/Fc-Gc | 18 | |
| 289 | **20th Floor** | Fc/7c-9c | 18 | |
| 290 | **21st Floor** | Gc/7c-9c | 18 | |
| 291 | **23rd Floor** | 5c/Fc-Gc | 18 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 292 | **26th Floor** | 5c/Fc-Gc | 18 | |
| **Tower C – Lift 4 - Shear Wall** | | | | |
| 293 | **Basement Floor** | 7c/Gc-Jc | 18 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 294 | | Jc/7c-9c | 20 | |
| 295 | **Ground Floor** | 7c/Gc-Jc | 20 | |
| 296 | **1st Floor** | 7c/Gc-Jc | 20 | |
| 297 | **2nd Floor** | Jc/7c-9c | 22 | |
| 298 | **3rd Floor** | 7c/Gc-Jc | 20 | |
| 299 | | Gc/7c-9c | De-bonded | |
| 300 | **4th Floor** | Jc/7c-9c | De-bonded | |
| 301 | | Gc/7c-9c | 22 | |
| 302 | **5th Floor** | 7c/Gc-Jc | 22 | |
| 303 | **6th Floor** | 7c/Gc-Jc | 22 | |
| 304 | **7th Floor** | Gc/7c-9c | 22 | |
| 305 | **8th Floor** | 7c/Gc-Jc | 20 | |
| 306 | **9th Floor** | Jc/7c-9c | 22 | |
| 307 | **11th Floor** | Gc/7c-9c | De-bonded | |
| 308 | | 7c/Gc-Jc | De-bonded | |
| 309 | **12th Floor** | Jc/7c-9c | 22 | |
| 310 | **13th Floor** | Jc/7c-9c | 22 | |
| 311 | **14th Floor** | Jc/7c-9c | 22 | |
| 312 | **15th Floor** | 7c/Gc-Jc | 24 | |
| 313 | **16th Floor** | 7c/Gc-Jc | 22 | |

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Date of Receipt – 27/12/2022

ULR No – TC600623200000119F
Date of submission – 25th April 2023



| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 314 | **17th Floor** | Jc/7c-9c | 24 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 315 | **18th Floor** | Jc/7c-9c | 22 | |
| 316 | **19th Floor** | 7c/Gc-Jc | 20 | |
| 317 | **20th Floor** | Gc/7c-9c | 22 | |
| 318 | **21st Floor** | Gc/7c-9c | 22 | |
| 319 | **22nd Floor** | Jc/7c-9c | 22 | |
| 320 | **23rd Floor** | 7c/Gc-Jc | 22 | |
| 321 | **24th Floor** | Gc/7c-9c | 20 | |
| 322 | **25th Floor** | Gc/7c-9c | 22 | |
| 323 | **26th Floor** | 7c/Gc-Jc | 22 | |
| **Tower B – Lift 5 - Shear Wall** | | | | |
| 324 | **Basement Floor** | Gc/4c-7c | 20 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 325 | | 7c/Gc-Jc | 20 | |
| 326 | **Ground Floor** | 4c/Gc-Jc | 20 | |
| 327 | **1st Floor** | Gc/4c-7c | 20 | |
| 328 | | 7c/Gc-Jc | 20 | |
| 329 | **2nd Floor** | 7c/Gc-Jc | De-bonded | |
| 330 | | Gc/4c-7c | De-bonded | |
| 331 | **3rd Floor** | Gc/4c-7c | 22 | |
| 332 | **5th Floor** | 7c/Gc-Jc | 20 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 333 | **6th Floor** | Gc/4c-7c | 20 | **Refer reference chart for estimated compressive strength range of in-situ concrete** |
| 334 | **7th Floor** | 4c/Gc-Jc | De-bonded | |
| 335 | **9th Floor** | 4c/Gc-Jc | 24 | |
| 336 | **10th Floor** | 4c/Gc-Jc | 24 | |
| 337 | **11th Floor** | 7c/Gc-Jc | 24 | |
| 338 | **12th Floor** | 7c/Gc-Jc | 24 | |
| 339 | | 4c/Gc-Jc | De-bonded | |
| 340 | **13th Floor** | Gc/4c-7c | 24 | |
| 341 | **14th Floor** | Gc/4c-7c | 24 | |
| 342 | **15th Floor** | 7c/Gc-Jc | 24 | |
| 343 | **16th Floor** | Gc/4c-7c | 22 | |
| 344 | **17th Floor** | 4c/Gc-Jc | 22 | |
| 345 | **18th Floor** | 4c/Gc-Jc | 22 | |
| 346 | **19th Floor** | 7c/Gc-Jc | 22 | |
| 347 | **20th Floor** | 7c/Gc-Jc | 22 | |
| 348 | | Gc/4c-7c | 24 | |
| 349 | **21st Floor** | Gc/4c-7c | 22 | |
| 350 | **22nd Floor** | 7c/Gc-Jc | 22 | |
| 351 | **23rd Floor** | 4c/Gc-Jc | 22 | |
| 352 | **24th Floor** | Gc/4c-7c | 22 | |
| 353 | **25th Floor** | 4c/Gc-Jc | 22 | |
| 354 | | 7c/Gc-Jc | 22 | |
| 355 | **26th Floor** | Gc/4c-7c | 22 | |
| 356 | | 7c/Gc-Jc | 22 | |

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*# Refer sketch **DWG.REF.No GL/BF-01 to GL/29F/TC-30** for Floor / Member / Grid Identification.*
*+ After applying necessary correction factor for impact position of Hammer.*
**As furnished by the customer.*

***Note-1:***

The estimation of strength of concrete by rebound hammer method cannot be held to be very accurate and probable accuracy of prediction of concrete strength in a structure is ±25%. Depending upon correlation curve and methodology adopted for establishing correlation between rebound index and likely compressive strength as per clause 8.1 of IS 516 (Part5/Sec4):2000.

***Note-2:***

1. The results relate only to the sample tested.
2. Report shall not be reproduced, expect in full, without the written approval of the lab.
3. The report shall be read in line with disclaimer given at rear side of the report.
4. Any correction invalidate this report.

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# REFERENCE STRENGTH CHART
# FOR REBOUND HAMMER TEST

**Test instrument** : Schmidt Hammer

**Make** : M/s. Proceq, Switzerland

**Type** : N-34

**Technical reference** : 1. IS 516 (Part 5/Sec4): 2020
2. Instrument manual furnished by M/s. Proceq, Switzerland

| REBOUND NUMBER | ESTIMATED COMPRESSIVE STRENGTH RANGE (N/Sq.mm) |
|---|---|
| 22 to 26 | 10 to 14 |
| 26 to 30 | 14 to 18 |
| 30 to 34 | 18 to 22 |
| 34 to 38 | 22 to 26 |
| 38 to 42 | 26 to 30 |
| 42 to 46 | 30 to 34 |

**Note :**

1. Estimated compressive strength is worked out based on the Calibration Chart developed for the above test instrument in our laboratory.

2. The estimation of strength of concrete by rebound hammer method cannot be held to be very accurate and probable accuracy of prediction of concrete strength in a structure is ±25%. Depending upon correlation curve and methodology adopted for establishing correlation between rebound index and likely compressive strength as per clause 8.1 of IS 516 (Part5/Sec4):2000.

**********

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# TEST REPORT

Contract No – 17671143/6
Date of Receipt – 27/12/2022
M/s. Army Welfare Housing Organization
C/o Prasanna Vihar, Marine Drive,
Opp. High Court, Kochi – 682 031.

ULR No – TC600623200000120F
Date of submission – 25th April 2023


## RESULTS OF COVER METER STUDIES

| | | |
|---|---|---|
| **Project** | : | Structural Stability Assessment Existing Chanderkunj Army Residential Tower-C of Army Welfare Housing Organization, Kochi, Kerala. |
| **Members tested** | : | RC Column, Beam, Slab & Shear wall |
| **Period of test** | : | 18th January 2023 to 23rd February 2023 |
| **Test Instrument** | : | Profometer 5+ |
| **Make** | : | M/s Proceq, Switzerland |
| **Technical Reference** | : | BS: 1881-(Part 204)-1988 and Test Instrument Manual "Metal & Reinforcement Detector"from M/s Proceq, Switzerland |

NDT
Building Materials
Reinforced Concrete Structures

| Sl. No. | Member / Floor Identification# | Grid Identification# | Range of Cover Concrete (mm)+ |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 1 | **Tower B Basement Floor RC Columns** | Ab/1b | 45-52 |
| 2 | | Bb/1b | 48-58 |
| 3 | | Cb/1b | 54-55 |
| 4 | | Kb/1b | 48-55 |
| 5 | | Lb/1b | 50-60 |
| 6 | | Mb/1b | 55-68 |
| 7 | | Ab/2b | 48-54 |
| 8 | | Bb/2b | 48-50 |
| 9 | | Cb/2b | 52-55 |
| 10 | | Kb/2b | 52-60 |
| 11 | | Lb/2b | 50-55 |
| 12 | | Mb/2b | 45-54 |
| 13 | | Ab-Bb/3b | 42-50 |
| 14 | | Cb/3b | 43-57 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 15 | **Tower B Basement Floor RC Columns** | Kb/3b | 55-66 |
| 16 | | Lb-Mb/3b | 55-72 |
| 17 | | Bb/5b | 40-46 |
| 18 | | Cb/5b | 51-63 |
| 19 | | Kb/5b | 55-67 |
| 20 | | Lb/5b | 45-50 |
| 21 | | Bb/8b | 42-46 |
| 22 | | Cb/8b | 48-54 |
| 23 | | Kb/8b | 50-60 |
| 24 | | Lb/8b | 60-70 |
| 25 | | Ab-Bb/10b | 34-42 |
| 26 | | Cb/10b | 47-53 |
| 27 | | Kb/10b | 37-45 |
| 28 | | Lb-Mb/10b | 50-63 |
| 29 | | Ab/11b | 47-51 |
| 30 | | Bb/11b | 49-56 |
| 31 | | Cb/11b | 48-55 |
| 32 | | Kb/11b | 50-65 |
| 33 | | Lb/11b | 47-50 |
| 34 | | Mb/11b | 45-50 |
| 35 | | Ab/12b | 46-53 |
| 36 | | Bb/12b | 53-62 |
| 37 | | Cb/12b | 30-38 |
| 38 | | Kb/12b | 50-58 |
| 39 | | Lb/12b | 43-52 |
| 40 | | Mb/12b | 65-70 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 41 | **Tower B Basement Floor RC Shear Wall** | Eb/2b-3b | 69-74 |
| 42 | | Hb/2b-3b | 50-54 |
| 43 | | Eb/10b-11b | 50-65 |
| 44 | | Hb/10b-11b | 57-66 |
| 45 | **Tower B Basement Floor RC Beam** | Cb-Eb/1b-2b | 25-29 |
| 46 | **Tower C Basement Floor RC Columns** | Ac/1c | 42-52 |
| 47 | | Bc/1c | 48-58 |
| 48 | | Cc/1c | 54-55 |
| 49 | | Kc/1c | 48-55 |
| 50 | | Lc/1c | 50-60 |
| 51 | | Mc/1c | 55-68 |
| 52 | | Ac/2c | 48-54 |
| 53 | | Bc/2c | 48-50 |
| 54 | | Cc/2c | 52-55 |
| 55 | | Hc/2c-3c | 50-54 |
| 56 | | Kc/2c | 52-60 |
| 57 | | Lc/2c | 50-55 |
| 58 | | Mc/2c | 45-54 |
| 59 | | Ac/3c | 48-46 |
| 60 | | Cc/3c | 48-42 |
| 61 | | Kc/3c | 52-56 |
| 62 | | Lc/3c | 69-75 |
| 63 | | Bc/6c | 50-55 |
| 64 | | Cc/6c | 52-61 |
| 65 | | Kc/6c | 50-56 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 66 | **Tower C Basement Floor RC Columns** | Lc/6c | 45-55 |
| 67 | | Bc/8c | 48-38 |
| 68 | | Cc/8c | 48-34 |
| 69 | | Kc/8c | 52-57 |
| 70 | | Lc/8c | 55-60 |
| 71 | | Ac/10c | 50-56 |
| 72 | | Cc/11c | 52-62 |
| 73 | | Ec/10c-11c | 50-57 |
| 74 | | Kc/10c | 48-30 |
| 75 | | Lc/10c | 48-26 |
| 76 | | Ac/11c | 52-58 |
| 77 | | Bc/11c | 69-77 |
| 78 | | Cc/11c | 50-57 |
| 79 | | Kc/11c | 52-63 |
| 80 | | Lc/11c | 50-58 |
| 81 | | Mc/11c | 45-57 |
| 82 | | Ac/12c | 48-22 |
| 83 | | Bc/12c | 48-18 |
| 84 | | Cc/12c | 52-59 |
| 85 | | Kc/12c | 69-78 |
| 86 | | Lc/12c | 50-58 |
| 87 | | Mc/12c | 52-64 |
| 88 | **Tower C Basement Floor RC Shear Wall** | Ec/2c-3c | 69-79 |
| 89 | | Hc/10c-11c | 45-56 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Ground Floor** | | | |
| 90 | **RC Column** | Lc/5c | 68 to 82 |
| 91 | | Lc/1c | 54 to 60 |
| 92 | | Hc/2c | 52 to 68 |
| 93 | | Bc/2c | 54 to 80 |
| 94 | | Cc/3c | 54 to 80 |
| 95 | | Bc/11c | 43 to 64 |
| 96 | | Ac/12c | 52 to 72 |
| 97 | | Ac/10c | 52 to 68 |
| 98 | **RC Beam** | 6c/Lc-Mc | 48-60 |
| 99 | | Bc-Ac/8c | 54 to 70 |
| 100 | | Bc/10c-11c | 48 to 70 |
| 101 | **RC Slab** | Mc-Lc/8c-10c | 46 to 64 |
| 102 | | Lc-Kc/3c-5c | 50 to 70 |
| 103 | | Lc-Kc/11c-12c | 48 to 60 |
| 104 | | Ec-Cc/1c-2c | 54 to 74 |
| 105 | | Bc-Cc/10c-11c | 55 to 78 |
| 106 | | Ac-Bc/9c-10c | 62 to 78 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| First Floor | | | |
| 107 | RC Column | Ac/11c | 46-55 |
| 108 | | Cc/11c | 48-57 |
| 109 | | Bc/10c | 45-60 |
| 110 | **RC Beam** | Cc/10c-11c | 42-50 |
| 111 | **RC Slab** | Bc-Cc/11c-12c | 32-38 |
| **Second Floor** | | | |
| 112 | **RC Column** | Kc-11c | 35-42 |
| 113 | **RC Beam** | Lc-Kc/10c | 30-40 |
| 114 | **RC Slab** | Lc-Kc/10c-11c | 32-44 |
| **Third Floor** | | | |
| 115 | **RC Column** | Ac/11c | 32-56 |
| 116 | **RC Beam** | Bc-Cc/11C | 40-45 |
| 117 | **RC Slab** | Ac-Bc /11c -12c | 25-35 |
| **Fourth Floor** | | | |
| 118 | **RC Column** | Cc/11c | 52-56 |
| 119 | **RC Beam** | Cc/10c-11c | 40-45 |
| 120 | **RC Slab** | Ec -Cc/10c-11c | 25-35 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Fifth Floor** | | | |
| 121 | **RC Column** | Mc-11c | 36-49 |
| 122 | | Kc-Lc/10c | 39-48 |
| 123 | | Kc-Lc/8c-10c | 28-38 |
| 124 | | Bc/1c-2c | 40-50 |
| 125 | **RC Beam** | Cc/2c-3c | 35-38 |
| 126 | **RC Slab** | Cc-Ec/2c-3c | 25-30 |
| **Sixth Floor** | | | |
| 127 | **RC Column** | Lc-2c | 46-56 |
| 128 | | Bc-2c | 48-55 |
| 129 | | Cc-6c | 55-60 |
| 130 | | Cc-10c | 39-46 |
| 131 | | Mc-11c | 51-60 |
| 132 | **RC Beam** | Bc-Cc/10c | 41-46 |
| 133 | | Ac-Bc/2c | 40-50 |
| 134 | | Lc/1c-2c | 40-50 |
| 135 | | Lc/10c-11c | 25-35 |
| 136 | **RC Slab** | Bc-Cc/9c-10c | 28-34 |
| 137 | | Ac-Bc/1c-2c | 30-35 |
| 138 | | Mc-Lc/1c-2c | 30-40 |
| 139 | | Kc-Lc/11c-12c | 26-37 |
| **Seventh Floor** | | | |
| 140 | **RC Column** | Bc-2c | 45-51 |
| 141 | | Ac-11c | 40-49 |
| 142 | | Mc-2c | 38-49 |
| 143 | | Mc-11c | 36-46 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 144 | **RC Beam** | Fc/1c-2c | 40-48 |
| 145 | | Ec-Cc/11c | 46-56 |
| 146 | | Lc/2c-3c | 40-52 |
| 147 | | Lc/10c-11c | 36-47 |
| 148 | **RC Slab** | Ec-Cc/11c-12c | 27-35 |
| 149 | | Fc-Cc/1c-2c | 35-42 |
| 150 | | Lc-Mc/2c-3c | 26-34 |
| 151 | | Lc-Mc/10c-11c | 36-47 |
| **Eighth Floor** | | | |
| 152 | **RC Column** | Cc-9c | 40-50 |
| 153 | | Ac-2c | 40-48 |
| 154 | | Kc-11c | 38-48 |
| 155 | **RC Beam** | Cc-Bc/11c | 38-48 |
| 156 | | Cc-Bc/3c | 38-48 |
| 157 | | Hc/11c-12c | 32-42 |
| 158 | | Cc-Dc/4c | 32-42 |
| 159 | **RC Slab** | Bc-Cc/11c-12c | 29-39 |
| 160 | | Bc-Cc/3c-5c | 28-35 |
| 161 | | Cc-Bc/5c-8c | 28-38 |
| 162 | | Bc-Cc/5c-8c | 26-36 |
| 163 | | Mc-Lc/11c-12c | 26-36 |
| **Nineth Floor** | | | |
| 164 | **RC Column** | Cc-11c | 40-50 |
| 165 | | Ac-2c | 36-46 |
| 166 | | Cc-2c | 35-39 |
| 167 | **RC Beam** | Bc-Cc/11c-12c | 42-50 |
| 168 | | Bc-Ac/2c | 30-40 |
| 169 | | Mc-Lc/2c | 30-40 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 170 | **RC Slab** | Fc-Gc/11c-12c | 27-37 |
| 171 | | Ac-Bc/1c-2c | 27-37 |
| 172 | | Mc-Lc/1c-2c | 28-38 |
| **Tenth Floor** | | | |
| 173 | **RC Column** | Lc-12c | 34-44 |
| 174 | | Kc-3c | 30-40 |
| 175 | | Lc-11c | 47-57 |
| 176 | | Cc-2c | 35-44 |
| 177 | **RC Beam** | Ec/11c-12c | 38-48 |
| 178 | | Cc-Dc/4c | 37-48 |
| 179 | | Mc-Lc/2c | 36-46 |
| 180 | | Lc/11c-12c | 40-50 |
| 181 | | Bc/3c-6c | 33-39 |
| 182 | **RC Slab** | Fc-Gc/11c-12c | 22-34 |
| 183 | | Cc-Dc/4c-7c | 40-50 |
| 184 | | Mc-Lc/2c-1c | 25-30 |
| 185 | | Mc-Lc/11c-12c | 30-40 |
| 186 | | Bc-Cc/3c-5c | 25-30 |
| **Eleventh Floor** | | | |
| 187 | **RC Column** | Ac-12c | 31-40 |
| 188 | | Cc-2c | 41-52 |
| 189 | | Mc-11c | 32-40 |
| 190 | | Mc-2c | 39-49 |
| 191 | | Kc-11c | 38-48 |
| 192 | **RC Beam** | Bc/10c-11c | 32-40 |
| 193 | | Kc-Jc/4c | 34-40 |
| 194 | | Ec/1c-2c | 46-52 |
| 195 | | Lc/10c-11c | 30-40 |
| 196 | | Bc-Cc/2c | 37-47 |
| 197 | | Kc/11c-12c | 35-46 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 198 | RC Slab | Ac-Bc/10c-11c | 26-36 |
| 199 | | Bc-Cc/1c-2c | 27-32 |
| 200 | | Mc-Lc/10c-11c | 26-34 |
| 201 | | Lc-Kc/2c-3c | 28-38 |
| 202 | | Kc-Lc/11c-12c | 26-34 |
| **Twelfth Floor** | | | |
| 203 | RC Column | Mc-Lc/2c | 32-44 |
| 204 | | Lc-11c | 30-35 |
| 205 | | Ac-2c | 44-54 |
| 206 | | Cc-11c | 45-54 |
| 207 | RC Beam | Mc-Lc/1c | 28-38 |
| 208 | | Kc-Lc/10c | 35-40 |
| 209 | | Ec-Cc/2c | 34-44 |
| 210 | | Cc/10c-11c | 37-42 |
| 211 | RC Slab | Mc-Lc/1c-2c | 27-33 |
| 212 | | Mc-Lc/11c-12c | 26-33 |
| 213 | | Dc-Cc/9c-6c | 23-32 |
| 214 | | Bc-Cc/10c-11c | 24-33 |
| **Thirteenth Floor** | | | |
| 215 | RC Column | Ac-11c | 41-45 |
| 216 | | Ac-2c | 39-47 |
| 217 | | Mc-11c | 42-49 |
| 218 | | Mc-2c | 45-55 |
| 219 | RC Beam | Cc/10c-11c | 43-49 |
| 220 | | Bc/3c-5c | 37-47 |
| 221 | | Kc/10c-11c | 40-50 |
| 222 | | Lc-Kc/3c | 32-42 |

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|---|---|---|---|
| 223 | **RC Slab** | Dc-Cc/10c-11c | 24-34 |
| 224 | | Ac-Cc/3c-5c | 25-30 |
| 225 | | Lc-Kc/10c-11c | 24-33 |
| 226 | | Mc-Lc/2c-3c | 25-30 |
| **Fourteenth Floor** | | | |
| 227 | **RC Column** | Kc-2c | 36-43 |
| 228 | | Cc-2c | 34-46 |
| 229 | | Mc-11c | 35-44 |
| 230 | | Cc-10c | 35-44 |
| 231 | **RC Beam** | Mc-Lc/2c | 38-45 |
| 232 | | Kc-Jc/4c | 40-50 |
| 233 | | Lc/10c-11c | 32-40 |
| 234 | | Cc/3c-2c | 35-48 |
| 235 | | Bc/10c-11c | 32-40 |
| 236 | **RC Slab** | Kc-Jc/4c-8c | 23-34 |
| 237 | | Lc-Kc/2c-3c | 34-32 |
| 238 | | Cc-Bc/1c-2c | 22-33 |
| 239 | | Kc-Hc/10c-11c | 23-28 |
| 240 | | Bc-Ac/10c-11c | 22-30 |
| **Fifteenth Floor** | | | |
| 241 | **RC Column** | Kc-11c | 40-50 |
| 242 | | Cc-10c | 44-52 |
| 243 | **RC Beam** | Lc-Kc/11c | 36-44 |
| 244 | | Bc-Cc/11c | 37-44 |
| 245 | | Dc-Cc/4c | 33-40 |
| 246 | **RC Slab** | Lc-Kc/11c-12c | 24-32 |
| 247 | | Jc-Kc/4c-8c | 25-36 |
| 248 | | Ac-Bc/11c-12c | 23-29 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Sixteenth Floor** | | | |
| 249 | **RC Column** | Ac-11c | 40-50 |
| 250 | | Mc-2c | 37-42 |
| 251 | | Cc-3c | 32-43 |
| 252 | | Kc-10 | 32-42 |
| 253 | **RC Beam** | Bc-Cc/11c | 36-44 |
| 254 | | Lc-Mc/2c | 31-41 |
| 255 | | Jc-Kc/9c | 34-42 |
| 256 | | Cc/3c-2c | 40-50 |
| 257 | | Kc-Lc/10c | 33-38 |
| 258 | **RC Slab** | Bc-Cc/11c-10c | 24-29 |
| 259 | | Mc-Lc/2c-3c | 23-34 |
| 260 | | Ac-Bc/2c-3c | 23-33 |
| 261 | | Lc-Kc/5c-8c | 26-32 |
| 262 | | Kc-Hc/11c-12c | 24-30 |
| **Seventeenth Floor** | | | |
| 263 | **RC Column** | Ac-2c | 45-55 |
| 264 | | Lc-2c | 39-48 |
| 265 | | Kc-11c | 30-40 |
| 266 | | Ac-12c | 38-48 |
| 267 | **RC Beam** | Cc/2c-3c | 35-45 |
| 268 | | Mc-Lc/2c | 34-44 |
| 269 | | Kc/11c-12c | 35-45 |
| 270 | | Bc/10c-11c | 34-43 |
| 271 | | Kc/2c-3c | 34-42 |
| 272 | **RC Slab** | Ec-Cc/2c-3c | 24-34 |
| 273 | | Kc-Hc/1c-2c | 23-33 |
| 274 | | Lc-Kc/11c-12c | 21-32 |
| 275 | | Ac-Bc/10c-11c | 25-34 |
| 276 | | Jc-Kc/3c-4c | 24-33 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Eighteenth Floor** | | | |
| 277 | **RC Column** | Ac-2c | 42-52 |
| 278 | | Kc-11c | 40-50 |
| 279 | | Ac-11c | 34-46 |
| 280 | **RC Beam** | Cc/2c-3c | 42-52 |
| 281 | | Mc-Lc/11c | 35-39 |
| 282 | | Ac/9c-10c | 31-42 |
| 283 | | Kc/3c-4c | 34-42 |
| 284 | **RC Slab** | Bc-Cc/2c-3c | 24-33 |
| 285 | | Mc-Lc/11c-12c | 25-33 |
| 286 | | Ec-Cc/10c-11c | 24-32 |
| 287 | | Hg-Fc/3c-4c | 25-32 |
| **Nineteenth Floor** | | | |
| 288 | **RC Column** | Cc-2c | 38-46 |
| 289 | | Mc-2c | 38-45 |
| 290 | | Mc-11c | 34-42 |
| 291 | **RC Beam** | Bc-Cc/3c | 37-42 |
| 292 | | Lc/2c-3c | 35-43 |
| 293 | | Lc/11c-12c | 32-39 |
| 294 | | Jc-Kc/9c | 33-42 |
| 295 | **RC Slab** | Bc-Cc/3c-4c | 24-34 |
| 296 | | Lc-Mc/2c-3c | 25-34 |
| 297 | | Mc-Lc/11c-12c | 24-31 |
| 298 | | Kc-Lc/5c-8c | 23-32 |
| **Twentieth floor** | | | |
| 299 | **RC Column** | Cc-2c | 38-48 |
| 300 | | Mc-3c | 30-40 |
| 301 | | Cc-10c | 30-37 |

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|---|---|---|---|
| 302 | RC Beam | Bc-Cc/3c | 34-44 |
| 303 | | Lc-Kc/3c | 32-41 |
| 304 | | Ac-Bc/11c | 35-40 |
| 305 | | Jc-Kc/4c | 33-42 |
| 306 | RC Slab | Bc-Cc/3c-5c | 23-32 |
| 307 | | Lc-Kc/3c-4c | 24-30 |
| 308 | | Ac-Bc/11c-10c | 24-28 |
| 309 | | Kc-Lc/5c-8c | 23-30 |
| **Twenty-first Floor** | | | |
| 310 | RC Column | Cc-11c | 40-46 |
| 311 | | Ac-2c | 41-49 |
| 312 | | Mc-2c | 42-48 |
| 313 | RC Beam | Bc/10c-11c | 38-44 |
| 314 | | Bc-Cc/3c | 36-42 |
| 315 | | Lc/2c-3c | 34-40 |
| 316 | | Cc-Dc/9c | 31-40 |
| 317 | RC Slab | Ac-Bc/11c-12c | 23-30 |
| 318 | | Bc-Cc/3c-4c | 21-28 |
| 319 | | Mc-Lc/2c-3c | 23-31 |
| 320 | | Cc-Dc/6c-9c | 24-30 |
| **Twenty-second floor** | | | |
| 321 | RC Column | Cc-2c | 40-50 |
| 322 | | Cc-10c | 38-46 |
| 323 | | Mc-2c | 34-43 |
| 324 | RC Beam | Bc/1c-2c | 35-45 |
| 325 | | Ac/11c-12c | 32-37 |
| 326 | | Mc-Lc/1c-2c | 32-40 |
| 327 | RC Slab | Bc-Ac/1c-2c | 22-32 |
| 328 | | Bc-Cc/10c-11c | 24-31 |
| 329 | | Hc-Kc/1c-2c | 24-30 |

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Technical Manager - NDT & RR

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ULR No – TC600623200000120F
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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Twenty-third Floor** | | | |
| 330 | **RC Column** | Mc-11c | 37-46 |
| 331 | | Ac-11c | 38-48 |
| 332 | **RC Beam** | Lc/9c-10c | 30-40 |
| 333 | | Dc-Cc/6c | 28-36 |
| 334 | | Bc-Cc/10c | 31-40 |
| 335 | **RC Slab** | Kc-Lc/8c-10c | 22-30 |
| 336 | | Gc-Fc/3c-4c | 24-30 |
| 337 | | Bc-Cc/9c-10c | 23-29 |
| **Twenty-fourth Floor** | | | |
| 338 | **RC Column** | Ac-11c | 40-50 |
| 339 | | Mc-11c | 33-44 |
| 340 | | Kc-3c | 35-42 |
| 341 | **RC Beam** | Bc/11c-12c | 35-46 |
| 342 | | Jc-Kc/9c | 34-40 |
| 343 | | Kc-Lc/11c | 30-40 |
| 344 | | Mc-Lc/3c | 31-40 |
| 345 | | Hc/3c-4c | 24-32 |
| 346 | **RC Slab** | Bc-Cc/11c-12c | 21-28 |
| 347 | | Jc-Kc/5c-9c | 24-30 |
| 348 | | Lc-Kc/11c-12c | 24-30 |
| 349 | | Mc-Lc/1c-2c | 22-30 |
| 350 | | Bc-Cc/6c-8c | 23-30 |
| **Twenty-fifth Floor** | | | |
| 351 | **RC Column** | Cc-2c | 30-42 |
| 352 | | Ac-12c | 37-42 |
| 353 | | Mc-2c | 34-40 |
| 354 | | Kc-11c | 38-48 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 355 | **RC Beam** | Cc/1c-2c | 28-40 |
| 356 | | Ac-Bc/11c | 35-42 |
| 357 | | Lc-Kc/3c | 30-48 |
| 358 | | Lc/10c-11c | 34-39 |
| 359 | | Kc-Jc/9c | 34-38 |
| 360 | **RC Slab** | Bc-Cc/1c-2c | 24-30 |
| 361 | | Bc-Cc/11c-12c | 24-30 |
| 362 | | Hc-Kc/2c-3c | 22-26 |
| 363 | | Lc-Kc/9c-10c | 24-30 |
| 364 | | Lc-Kc/5c-8c | 24-29 |
| **Twenty-Sixth Floor** | | | |
| 365 | **RC Column** | Ac/11c | 40-54 |
| 366 | | Ac/2c | 36-45 |
| 367 | | Kc/3c | 35-45 |
| 368 | | Kc/11c | 40-56 |
| 369 | **RC Beam** | Bc-Cc/11c | 32-40 |
| 370 | | Bc/2c-3c | 30-38 |
| 371 | | Lc/2c-3c | 30-40 |
| 372 | | Kc/11c-12c | 34-40 |
| 373 | | Cc-Dc/9c | 34-40 |
| 374 | **RC Slab** | Ac-Bc/11c-12c | 26-31 |
| 375 | | Ac-Bc/1c-2c | 23-30 |
| 376 | | Mc-Lc/2c-3c | 22-28 |
| 377 | | Mc-Lc/11c-12c | 22-28 |
| 378 | | Lc-Kc/5c-8c | 24-30 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Tower C – Lift 1 - Shear Wall** | | | |
| 379 | **Basement floor** | Fc/4c-7c | 24-54 |
| 380 | **Ground Floor** | Fc/4c-7c | 28-58 |
| 381 | **4th Floor** | 7c/Dc-Fc | 25-60 |
| 382 | **5th Floor** | Fc/4c-7c | 26-39 |
| 383 | **9th Floor** | Fc/4c-7c | 36-56 |
| 384 | **11th Floor** | 7c/Dc-Fc | 27-56 |
| 385 | **12th Floor** | 4c/Dc-Fc | 29-51 |
| 386 | **13th Floor** | 7c/Dc-Fc | 19-39 |
| 387 | **14th Floor** | Fc/4c-7c | 26-39 |
| 388 | **16th Floor** | 4c/Dc-Fc | 27-41 |
| 389 | **17th Floor** | Fc/4c-7c | 26-44 |
| 390 | **22nd Floor** | Fc/4c-7c | 21-44 |
| 391 | **24th Floor** | 7c/Dc-Fc | 26-38 |
| 392 | **26th Floor** | Fc/4c-7c | 26-44 |
| **Tower C – Lift 2 - Shear Wall** | | | |
| 393 | **Ground Floor** | 7c/Dc-Fc | 18-31 |
| 394 | **4th Floor** | 7c/Dc-Fc | 18-28 |
| 395 | **6th Floor** | 7c/Dc-Fc | 20-34 |
| 396 | **8th Floor** | 7c/Dc-Fc | 22-36 |
| 397 | **12th Floor** | 7c/Dc-Fc | 24-36 |
| 398 | **13th Floor** | 7c/Dc-Fc | 22-36 |
| 399 | **16th Floor** | Fc/7c-9c | 22-38 |
| 400 | **17th Floor** | Fc/7c-9c | 20-36 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 401 | **23rd Floor** | Dc/7c-9c | 27-36 |
| **Tower C– Lift 3 - Shear Wall** | | | |
| 402 | **Basement Floor** | 5c/Fc-Gc | 30-47 |
| 403 | **Ground Floor** | Gc/7c-9c | 26-37 |
| 404 | **1st Floor** | Fc/7c-9c | 27-38 |
| 405 | **3rd Floor** | Fc/7c-9c | 30-37 |
| 406 | **4th Floor** | Gc/7c-9c | 26-33 |
| 407 | **5TH Floor** | Gc/7c-9c | 21-38 |
| 408 | **6th Floor** | Gc/7c-9c | 18-37 |
| 409 | **7th Floor** | Fc/7c-9c | 20-39 |
| 410 | **9th Floor** | 5c/Fc-Gc | 20-36 |
| 411 | **10th Floor** | 5c/Fc-Gc | 23-37 |
| 412 | **13th Floor** | 5c/Fc-Gc | 18-38 |
| 413 | **17th Floor** | 5c/Fc-Gc | 18-37 |
| 414 | **20th Floor** | Fc/7c-9c | 30-37 |
| 415 | **21st Floor** | Gc/7c-9c | 19-35 |
| 416 | **23rd Floor** | 5c/Fc-Gc | 18-37 |
| 417 | **26th Floor** | 5c/Fc-Gc | 18-34 |
| **Tower C – Lift 4 - Shear Wall** | | | |
| 418 | **Ground Floor** | 7c/Gc-Jc | 18-33 |
| 419 | **1st Floor** | 7c/Gc-Jc | 22-34 |
| 420 | **5th Floor** | 7c/Gc-Jc | 18-34 |
| 421 | **7th Floor** | Gc/7c-9c | 22-31 |
| 422 | **12th Floor** | Jc/7c-9c | 22-31 |
| 423 | **15th Floor** | 7c/Gc-Jc | 19-33 |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 424 | **16th Floor** | 7c/Gc-Jc | 23-36 |
| 425 | **18th Floor** | Jc/7c-9c | 18-34 |
| 426 | **19th Floor** | 7c/Gc-Jc | 21-31 |
| 427 | **22nd Floor** | Jc/7c-9c | 20-32 |
| 428 | **23rd Floor** | 7c/Gc-Jc | 20-34 |
| 429 | **26th Floor** | 7c/Gc-Jc | 18-31 |
| **Tower B – Lift 5 - Shear Wall** | | | |
| 430 | **Basement Floor** | Gc/4c-7c | 19-33 |
| 431 | **1st Floor** | Gc/4c-7c | 19-33 |
| 432 | **4th Floor** | 7c/Gc-Jc | 22-36 |
| 433 | **6th Floor** | Gc/4c-7c | 20-34 |
| 434 | **8th Floor** | 4c/Gc-Jc | 21-33 |
| 435 | **9th Floor** | 4c/Gc-Jc | 18-34 |
| 436 | **11th Floor** | 7c/Gc-Jc | 18-36 |
| 437 | **13th Floor** | Gc/4c-7c | 19-36 |
| 438 | **14th Floor** | Gc/4c-7c | 21-31 |
| 439 | **16th Floor** | Gc/4c-7c | 18-33 |
| 440 | **17th Floor** | 4c/Gc-Jc | 18-31 |
| 441 | **20th Floor** | 7c/Gc-Jc | 22-34 |
| 442 | **21th Floor** | Gc/4c-7c | 18-33 |
| 443 | **24th Floor** | Gc/4c-7c | 21-30 |
| 444 | **25th Floor** | 4c/Gc-Jc | 18-31 |

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*# Refer sketch **DWG.REF.No GL/BF-01 to GL/29F/TC-30** for Floor / Member / Grid Identification*

*+ Inclusive of Plaster.*

***Note:***

1. The results relate only to the sample tested.
2. Report shall not be reproduced, expect in full, without the written approval of the lab.
3. The report shall be read in line with disclaimer given at rear side of the report.
4. Any correction invalidate this report.

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# TEST REPORT

Contract No – 17671143/7
Date of Receipt –27/12/2022
M/s. Army Welfare Housing Organization
C/o Prasanna Vihar, Marine Drive,
Opp. High Court, Kochi – 682 031.

ULR No – TC600623200000121F
Date of submission – 25th April 2023


## RESULTS OF HALF CELL POTENTIAL DIFFERENCE MEASUREMENT TEST

NDT
Building Materials
Reinforced Concrete Structures

| | | |
|---|---|---|
| **Project** | : | Structural Stability Assessment ExistingChanderkunj Army Residential Tower-C of Army Welfare Housing Organization, Kochi, Kerala. |
| **Members Tested** | : | RC Corbels, Columns, Beams, Slab, Shear wall & Staircase Waist Slab |
| **Period of test** | : | 18th January 2023 to 23rd February 2023 |
| **Temperature** | : | 32°C |
| **Test Instrument** | : | CANIN Corrosion Analyzer |
| **Make** | : | M/s. Proceq, Switzerland |
| **Technical reference** | : | IS 516 (Part 5/Sec2): 2021 |

| Sl. No. | Floor / Member / Grid Identification# | Half-cell Measurements: Measured potential difference (mv) | Remarks |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| **Tower B** | | | |
| 1 | Basement Floor RC Column, 9b/Kb | -197 -156 -93<br>-150 -145 -132<br>-140 -127 -168 | **Refer Reference chart for Half-cell potential difference measurement Test** |
| 2 | Basement Floor RC Column, Cb/5b | -172 -179 -173<br>-186 -179 -172<br>-176 -190 -190 | |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 3 | Basement Floor<br>RC Column,<br>Kb/8b | -93 -98 -106<br>-108 -197 -101<br>-129 -196 -186 | **Refer Reference chart for Half-cell potential difference measurement Test** |
| 4 | Basement Floor<br>RC Beam,<br>1b/Hb-Eb | -201 -221 -215<br>-233 -231 -209<br>-222 -207 -204 | |
| 5 | Basement Floor<br>RC Slab<br>Cb-Eb/11b-12b | -318 -380 -325<br>-355 -348 -380<br>-341 -333 -344 | |
| **Tower C** | | | |
| 6 | Basement Floor<br>RC Corbel,<br>Mc/2c | -181 -210 -195<br>-188 -201 -183<br>-197 -189 -206 | |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 7 | Basement Floor RC Column, Cc/6c | -304 -389 -308<br>-333 -387 -322<br>-359 -346 -372 | **Refer Reference chart for Half-cell potential difference measurement Test** |
| 8 | Basement Floor RC Column, Lc/6c | -135 -183 -181<br>-139 -155 -166<br>-148 -181 -156 | |
| 9 | Basement Floor RC Column, Cc/11c | -185 -208 -199<br>-189 -202 -197<br>-201 -189 -191 | |
| 10 | Basement Floor RC Beam, 1c/Cc-Kc | -139 -183 -151<br>-181 -142 -180<br>-155 -164 -172 | |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 11 | Basement Floor<br>RC Beam,<br>Mc/3c-10c | -185 -196 -188<br>-192 -189 -190<br>-191 -193 -186 | **Refer Reference chart for Half-cell potential difference measurement Test** |
| 12 | Ground Floor<br>RC Column,<br>Hc/2c | -206 -209 -312<br>-325 -321 -346<br>-289 -284 -322 | |
| 13 | Ground Floor<br>RC Column,<br>Lc/11c | -244 -219 -229<br>-209 -215 -241<br>-211 -221 -235 | |
| 14 | Ground Floor<br>RC Column,<br>Kc/10c | -264 -365 -289<br>-280 -286 -274<br>-296 -281 -288 | |

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| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 15 | Ground Floor<br>RC Column,<br>Bc/10c | -215 -286 -311*<br>-328 -386 -344<br>-381 -281 -296 | **Refer Reference chart for Half-cell potential difference measurement Test** |
| 16 | Ground Floor<br>RC Beam<br>Ec-Cc/1c | -264 -330 -286<br>-277 -291 -284<br>-286 -312 -328 | |
| 17 | 10th Floor<br>Shear wall<br>10c-11c/Ec | -340 -259 -260<br>-315 -367 -316<br>-285 -290 -338 | |
| 18 | 13th Floor<br>Staircase Waist Slab | -280 -320 -310<br>-317 -297 -286<br>-298 -305 -313 | |

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Contract No – 17671143/7
Date of Receipt –27/12/2022

ULR No – TC600623200000121F
Date of submission – 25th April 2023


| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 19 | Lift – 5<br>Shear Wall<br>Gc/4c-7c | -476 -441 -429<br>-481 -496 -486<br>-432 -417 -441 | **Refer Reference chart for Half-cell potential difference measurement Test** |

# Refer ***DWG.REF.No GL/BF-01 to GL/29F/TC-30*** for floor member/grid identification

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## REFERENCE CHART FOR HALF CELL POTENTIAL DIFFERENCE MEASUREMENT TEST

**Test instrument** : CANIN Corrosion Analyser

**Make** : M/s. Proceq, Switzerland

**Technical reference** : IS 516 (Part 5/Sec2): 2021

| Sl. No. | Measured Potential Difference | Probability of Corrosion |
|---|---|---|
| 1. | -200mV or less negative than -200mV | **Low Probability of Corrosion** (There is a greater than 90 percent probability that no reinforcing steel corrosion is occurring in that area at the time of measurement) |
| 2. | Between (-) 200 mv to (-) 350 mv | **Uncertainty of corrosion** (Corrosion activity of the reinforcing steel in that area is uncertain) |
| 3. | < – 350 mV or more negative than – 350 mV | **High probability of corrosion** (There is a greater than 90 percent probability that reinforcing steel corrosion is occurring in that area at the time of measurement |
| 4. | < – 500 mV | **Severe probability of corrosion** |

As per Table 1: Criteria for Corrosion Condition of Rebar in Concrete Cu/CuSO4 electrode half-cell (Clauses 4 and 6.11)

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# TEST REPORT

Contract No – 17671143/8
Date of Receipt – 27/12/2022
M/s. Army Welfare Housing Organization
C/o Prasanna Vihar, Marine Drive,
Opp. High Court, Kochi – 682 031.

ULR No – TC600623200000122F
Date of submission – 25th April 2023


NDT
Building Materials
Reinforced Concrete Structures

## RESULTS OF CARBONATION TEST

**Project** : Structural Stability Assessment Existing Chanderkunj Army Residential Tower-C of Army Welfare Housing Organization, Kochi, Kerala.

**Members tested** : RC Columns, Beams, Shear wall & Staircsae Waist Slab

**Date of test** : 18th January 2023 to 23rd February 2023

**Chemical used for** : **Phenolphthalein indicator** normally 1gm Phenolphthalein dissolved **Carbonation test** in 70ml Ethyl alcohol & diluted to 100 ml with distilled or Deionized water.

**Carbonation test**

**Technical reference** : IS 516 (Part-5/ Sec-3) 2021

| Sl. No. | Member Identification# | Grid Identification# | Depth of Carbonation (mm) | Stipulation |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| **Tower B** | | | | |
| **Basement Floor** | | | | |
| 1 | RC Beam | Mb/9b-10b | 30-40 | **Carbonation should not reach reinforcement level during life time of the structure** |
| 2 | RC Beam | Ab/9b-10b | 25-32 | |
| 3 | RC Shear Wall | Eb-Fb/2b-3b | 30-35 | |
| 4 | RC Column | Cb/1b | 40-50 | |
| 5 | RC Column | Cb/12b | 38-45 | |
| 6 | RC Column | Mb/2b | 25-30 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 7 | RC Column | Cb/3b | 30-40 | **Carbonation should not reach reinforcement level during life time of the structure** |
| 8 | RC Beam | Eb/10b-11b | 20-28 | |
| 9 | RC Column | Lb/1b | 34-38 | |
| 10 | RC Column | Kb/9b | 40-45 | |
| 11 | RC Beam | 10b/Ab-Bb | 20-25 | |
| 12 | RC Column | Bb/8b | 35-40 | |
| 13 | RC Beam | 1b/Fb-Gb | 30-35 | |
| **Ground Floor** | | | | |
| 14 | RC Beam | Ab/9b-10b | 28-35 | |
| 15 | RC Column | Lb/5b | 40-48 | |
| 16 | RC Beam | Mb/3b-4b | 30-32 | |
| 17 | RC Column | Kb/1b | 32-40 | |
| **Tower C** | | | | |
| **Basement Floor** | | | | |
| 18 | RC Column | Cc/11c | 40-45 | |
| 19 | RC Column | Mc/1c | 35-40 | |
| 20 | RC Column | Cc/10c | 40-42 | |
| 21 | RC Column | Bc/1c | 38-40 | |
| 22 | RC Column | Fc/1c | 40-48 | |

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Date of submission – 25th April 2023


| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 23 | RC Shear Wall | Hc/10c-11c | 30-35 | **Carbonation should not reach reinforcement level during life time of the structure** |
| 24 | RC Column | Ac/10c | 28-34 | |
| 25 | RC Shear Wall | Ec/2c-3c | 25-30 | |
| 26 | RC Column | Cc/10c | 40-45 | |
| 27 | RC Beam | Cc/10c-11c | 20-25 | |
| 28 | RC Column | Cc/5c | 35-40 | |
| 29 | RC Column | Kc/3c | 40-42 | |
| 30 | RC Beam | Mc/3c-5c | 28-32 | |
| 31 | RC Column | Kc/6c | 30-38 | |
| 32 | RC Column | Kc/12c | 45-48 | |
| **Ground Floor** | | | | |
| 33 | RC Column | Ac/12c | 38-40 | |
| 34 | RC Column | Mc/3c | 30-32 | |
| 35 | RC Column | Lc/10c | 28-34 | |
| 36 | RC Beam | Ac/8c-10c | 20-22 | |
| 37 | RC Beam | Mc/3c-5c | 25-28 | |

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TC-6006

Contract No – 17671143/8
Date of Receipt – 27/12/2022

ULR No – TC600623200000122F
Date of submission – 25th April 2023



| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Second Floor** | | | | **Carbonation should not reach reinforcement level during life time of the structure** |
| 38 | RC Slab | Lc-Kc/9c-10c (C-0204) | 10-14 | |
| 39 | RC Beam | Refuge Area East Side | 20-25 | |
| 40 | RC Beam | Refuge Area West Side | 15-20 | |
| 41 | RC Slab | Refuge Area East Side | 12-15 | |
| 42 | RC Waist Slab | Main Staircase | 15-20 | |
| **Fifth Floor** | | | | |
| 43 | RC Slab | Refuge Area East Side | 8-12 | |
| 44 | RC Column | Cc/6c | 35-40 | |
| **Seventh Floor** | | | | |
| 45 | RC Slab | Refuge Area East Side | 12-18 | |
| 46 | RC Shear Wall | Hc/10c-11c | 22-28 | |
| **Twelfth Floor** | | | | |
| 47 | RC Beam | North Side (C-1203) | 25-30 | |

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| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Fourteenth Floor** | | | | **Carbonation should not reach reinforcement level during life time of the structure** |
| 48 | RC Column | Cc/8c | 25-32 | |
| **Twenty Fourth Floor** | | | | |
| 49 | RC Shear Wall | Ec/2c-3c | 18-24 | |

# Refer ***DWG.REF.No GL/BF-01 to GL/29F/TC-30*** for floor member/grid identification.

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# TEST REPORT

Contract No – 17671143/9
Date of Receipt – 27/12/2022
Date of submission – 25th April 2023


M/s. Army Welfare Housing Organization
C/o Prasanna Vihar, Marine Drive,
Opp. High Court, Kochi – 682 031.

## RESULTS OF RESIPOD TEST

**Project** : Structural Stability Assessment Existing Chanderkunj Army Residential Tower-C of Army Welfare Housing Organization, Kochi, Kerala.
**Members tested** : RC Columns, Beams & Slab
**Period of test** : 18th January 2023 to 23nd February 2023
**Grade of concrete** : M30*
**Age of concrete** : More than 28 days*
**Make** : M/s. Proceq, Switzerland.
**Technical reference** : 1.RILEM TC 154-EMC Electrochemical Techniques for Measuring metallic corrosion
b. Instrument manual furnished by M/s. Proceq, Switzerland.

| Sl. No | Floor Identification# | Member | Grid Identification# | Resistivity Measurements (KΩCm) | Remarks |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| **Tower B** | | | | | |
| 1 | Basement Floor | RC Column | Ab/1b | 52 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 2 | | | Cb/1b | 22 | |
| 3 | | | Kb/1b | 22 | |
| 4 | | | Lb/1b | 24 | |
| 5 | | | Mb/1b | 17 | |
| 6 | | | Ab/2b | 31 | |
| 7 | | | Bb/2b | 37 | |
| 8 | | | Cb/2b | 22 | |
| 9 | | | Lb/2b | 32 | |
| 10 | | | Mb/2b | 30 | |
| 11 | | | Ab-Bb/3b | 34 | |
| 12 | | | Cb/3b | 14 | |
| 13 | | | Kb/3b | 17 | |
| 14 | | | Bb/5b | 17 | |
| 15 | | | Kb/5b | 11 | |

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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Tower B** | | | | | |
| 16 | **Basement Floor** | **RC Column** | Lb/5b | 53 | **Refer Resipod Reference Chart For Likelihood Corrosion** |
| 17 | | | Bb/8b | 21 | |
| 18 | | | Kb/8b | 18 | |
| 19 | | | Lb/8b | 28 | |
| 20 | | | Ab-Bb/10b | 16 | |
| 21 | | | Lb-Mb/10b | 40 | |
| 22 | | | Ab/11b | 28 | |
| 23 | | | Bb/11b | 25 | |
| 24 | | | Cb/11b | 25 | |
| 25 | | | Kb/11b | 37 | |
| 26 | | | Lb/11b | 25 | |
| 27 | | | Mb/11b | 28 | |
| 28 | | | Ab/12b | 21 | |
| 29 | | | Bb/12b | 31 | |
| 30 | | | Cb/12b | 22 | |
| 31 | | | Kb/12b | 42 | |
| 32 | | **RC Beam** | 1b/Bb-Cb | 26 | |
| 33 | | | 1b/Hb-Eb | 46-54 | |
| 34 | | | Kb/1b-2b | 37 | |
| 35 | | | 2b/Cb-Eb | 24 | |
| 36 | | | Lb/5b-8b | 37 | |
| 37 | | | 11b/Cb-Eb | 22 | |
| 38 | | | 11b/Hb-Kb | 22 | |
| 39 | | | Cb/11b-12b | 20 | |
| 40 | | | Hb/11b-12b | 28 | |
| 41 | | | Lb/11b-12b | 60 | |
| 42 | | | Mb/11b-12b | 33 | |
| 43 | | | 12b/Hb-Kb | 37 | |

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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Tower B** | | | | | |
| 44 | **Basement Floor** | **RC Slab** | Bb-Cb/1b-2b | 23 | **Refer Resipod Reference Chart For Likelihood Corrosion** |
| 45 | | | Cb-Eb/1b-2b | 33 | |
| 46 | | | Hb-Kb/1b-2b | 22 | |
| 47 | | | Kb-Lb/1b-2b | 10 | |
| 48 | | | Ab-Bb/2b-3b | 25 | |
| 49 | | | Bb-Cb/2b-3b | 20 | |
| 50 | | | Cb-Eb/2b-3b | 12 | |
| 51 | | | Hb-Kb/2b-3b | 19 | |
| 52 | | | Ab-Bb/3b-5b | 17 | |
| 53 | | | Mb-Lb/3b-5b | 32 | |
| 54 | | | Ab-Bb/5b-8b | 18 | |
| 55 | | | Mb-Lb/5b-8b | 10 | |
| 56 | | | Ab-Bb/8b-10b | 12 | |
| 57 | | | Kb-Lb/8b-10b | 18 | |
| 58 | | | Mb-Lb/8b-10b | 14 | |
| 59 | | | Ab-Bb/10b-11b | 27 | |
| 60 | | | Cb-Eb/10b-11b | 16 | |
| 61 | | | Ab-Bb/11b-12b | 19 | |
| 62 | | | Bb-Cb/11b-12b | 15 | |
| 63 | | | Kb-Lb/11b-12b | 17 | |
| 64 | | | Mb-Lb/11b-12b | 14 | |
| **Tower B** | | | | | |
| 65 | **Basement Floor** | **RC Column** | Ac/1c | 14 | **Refer Resipod Reference Chart For Likelihood Corrosion** |
| 66 | | | Bc/1c | 47 | |
| 67 | | | Cc/1c | 33 | |
| 68 | | | Kc/1c | 40 | |
| 69 | | | Ac/2c | 11 | |
| 70 | | | Bc/2c | 83 | |
| 71 | | | Cc/2c | 94 | |

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Contract No – 17671143/9
Date of Receipt – 27/12/2022

Date of submission – 25th April 2023


| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Tower C** | | | | | |
| 72 | **Basement Floor** | **RC Column** | Hc/2c-3c | 47 | **Refer Resipod Reference Chart For Likelihood Corrosion** |
| 73 | | | Kc/2c | 22 | |
| 74 | | | Lc/2c | 44 | |
| 75 | | | Mc/2c | 20 | |
| 76 | | | Ac/3c | 60 | |
| 77 | | | Bc/3c | 60 | |
| 78 | | | Cc/3c | 43 | |
| 79 | | | Kc/3c | 12 | |
| 80 | | | Lc/3c | 8 to 10 | |
| 81 | | | Bc/6c | 9 | |
| 82 | | | Cc/6c | 22 | |
| 83 | | | Kc/6c | 8 to 11 | |
| 84 | | | Lc/6c | 60 | |
| 85 | | | Bc/8c | 66 | |
| 86 | | | Cc/8c | 33 | |
| 87 | | | Kc/8c | 9 | |
| 88 | | | Lc/8c | 66 | |
| 89 | | | Ac/10c | 10 | |
| 90 | | | Bc/10c | 23 to 32 | |
| 91 | | | Cc/10c | 44 | |
| 92 | | | Cc/11c | 12 | |
| 93 | | | Ec/10c-11c | 17 | |
| 94 | | | Kc/10c | 14 | |
| 95 | | | Lc/10c | 15 | |
| 96 | | | Ac/11c | 24 to 36 | |
| 97 | | | Bc/11c | 18 to 30 | |
| 98 | | | Cc/11c | 17 to 40 | |
| 99 | | | Kc/11c | 20 | |

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Contract No – 17671143/9
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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Tower C** | | | | | |
| 100 | Basement Floor | RC Column | Lc/11c | 10 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 101 | | | Ac/12c | 28 to 45 | |
| 102 | | | Bc/12c | 27 | |
| 103 | | | Cc/12c | 51 | |
| 104 | | | Kc/12c | 42 | |
| 105 | | | Lc/12c | 40 | |
| 106 | | | Mc/12c | 16 | |
| 107 | | RC Beam | 1c/Bc-Cc | 20 | |
| 108 | | | 1c/Lc-Mc | 13 | |
| 109 | | | Cc/2c-3c | 45 | |
| 110 | | | 3c/Bc-Cc | 32 | |
| 111 | | | 3c/Hc-Kc | 30 | |
| 112 | | | Bc/11c-12c | 22 | |
| 113 | | | Mc/3c-10c | 50 to 60 | |
| 114 | | | Kc/10c-11c | 11 | |
| 115 | | | Ac/3c-5c | 12 | |
| 116 | | | Lc/3c-5c | 16 | |
| 117 | | | Kc/11c-12c | 40 | |
| 118 | | | 11c/Ac-Bc | 24 | |
| 119 | | | 11c/Hc-Kc | 18 | |
| 120 | | RC Slab | Bc-Cc/1c-2c | 29 | |
| 121 | | | Lc-Mc/1c-2c | 16 | |
| 122 | | | Bc-Cc/2c-3c | 55 | |
| 123 | | | Kc-Lc/3c-4c | 15 | |
| 124 | | | Ac-Bc/11c-12c | 16 | |
| 125 | | RC Shear Wall | Ec/2c-3c | 80 | |
| 126 | | | Hc/10c-11c | 59 | |

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Contract No – 17671143/9
Date of Receipt – 27/12/2022

Date of submission – 25th April 2023


| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Tower C** | | | | | |
| 127 | **Ground Floor** | **RC Column** | Lc/5c | 68 to 82 | **Refer Resipod Reference Chart For Likelihood Corrosion** |
| 128 | | | Lc/1c | 54 to 60 | |
| 129 | | | Hc/2c | 52 to 68 | |
| 130 | | | Bc/2c | 54 to 80 | |
| 131 | | | Cc/3c | 54 to 80 | |
| 132 | | | Bc/11c | 43 to 64 | |
| 133 | | | Ac/12c | 52 to 72 | |
| 134 | | | Ac/10c | 52 to 68 | |
| 135 | | **RC Beam** | 6c/Lc-Mc | 48 to 60 | |
| 136 | | | Bc-Ac/8c | 54 to 70 | |
| 137 | | | Bc/10c-11c | 48 to 70 | |
| 138 | | **RC Slab** | Mc-Lc/8c-10c | 46 to 64 | |
| 139 | | | Lc-Kc/3c-5c | 50 to 70 | |
| 140 | | | Lc-Kc/11c-12c | 48 to 60 | |
| 141 | | | Ec-Cc/1c-2c | 54 to 74 | |
| 142 | | | Bc-Cc/10c-11c | 55 to 78 | |
| 143 | | | Ac-Bc/9c-10c | 62 to 78 | |
| 144 | **First Floor** | **RC Column** | Cc/5c | 46 to 56 | |
| 145 | | | Kc/3c | 52-74 | |
| 146 | | | Kc/10c | 54-60 | |
| 147 | | **RC Beam** | Hc-Kc/10c-11c | 47-57 | |
| 148 | | | Bc-Cc/1c-2c | 48 to 56 | |
| 149 | | | Hc-Kc/2c-3c | 60 to 76 | |
| 150 | | | Mc-Lc/2c-3c | 58 to 78 | |
| 151 | **Second Floor** | **RC Column** | Cc/10c | 52 to 66 | |
| 152 | | | Cc/3c | 47 to 61 | |
| 153 | | | Mc/2c | 50 to 60 | |
| 154 | | | Kc/2c | 56 to 74 | |

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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 155 | | RC Column | Kc/3c | 58 to 72 | |
| 156 | | | Mc-Lc | 80 to 90 | |
| 157 | | RC Beam | Mc-Lc/11c | 74 to 90 | |
| 158 | | | Kc-Hc/11c | 61 to 75 | |
| 159 | | RC Slab | Mc-Lc/11c-12c | 24 to 30 | |
| 160 | | | Ac-Bc/11c-12c | 62 to 74 | |
| 161 | | | Kc-Hc/2c-3c | 44 to 58 | |
| 162 | Third Floor | RC Column | Ac/11c | 58 to 77 | |
| 163 | | | Kc/10c | 68 to 72 | |
| 164 | | RC Slab | Kc-Lc/10c-11c | 64 to 74 | |
| 165 | | | Kc-Gc/3c-4c | 60 to 74 | |
| 166 | Fourth Floor | RC Column | Cc/11c | 59 to 74 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 167 | | | Cc-3c | 79 to 84 | |
| 168 | | | Kc/2c | 72 to 82 | |
| 169 | | RC Slab | Ec -Cc/10c-11c | 72 to 80 | |
| 170 | Fifth Floor | RC Column | Ac-2c | 87 to 90 | |
| 171 | | | Hc/2c | 68 to 79 | |
| 172 | | | Kc/10c | 74 to 90 | |
| 173 | | RC Beam | Bc/11c-12c | 40 to 45 | |
| 174 | | | Cc/2c-3c | 35 to 40 | |
| 175 | | | Kc-Lc/11c | 39 to 48 | |
| 176 | | RC Slab | Ac-Bc/1c-2c | 25 to 30 | |
| 177 | | | Mc-Lc/10c-11c | 28 to 38 | |
| 178 | Sixth Floor | RC Column | Ac/11c | 78 to 90 | |
| 179 | | | Cc-2c | 87 to 90 | |
| 180 | | | Kc/2c | 69 to 80 | |
| 181 | | | Kc/11c | 72 to 80 | |
| 182 | | RC Slab | Cc-Ec/11c | 72 to 89 | |
| 183 | | | Cc/2c-3c | 84 to 90 | |
| 184 | | | Kc/2c-3c | 84 to 92 | |

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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 185 | Seventh Floor | RC Column | Cc/10c | 88 to 99 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 186 | | | Ac-2c | 74 to 80 | |
| 187 | | | Kc/2c | 78 to 90 | |
| 188 | | RC Beam | Kc/11c | 76 to 90 | |
| 189 | | | LC/1c-2c | 84 to 90 | |
| 190 | | | Cc-Bc/12c | 84 to 96 | |
| 191 | | RC Slab | Ac-Bc/2c-3c | 78 to 90 | |
| 192 | | | Lc-Kc/10c-11c | 78 to 92 | |
| 193 | Eighth Floor | RC Column | Kc/5c | 58 to 64 | |
| 194 | | | Ac-2c | 78 to 84 | |
| 195 | | | Kc/2c | 68 to 78 | |
| 196 | | RC Beam | Kc-Lc/3c | 62 to 70 | |
| 197 | | | Lc/10c-11c | 84 to 92 | |
| 198 | | RC Slab | Bc-Cc/1c-2c | 86 to 92 | |
| 199 | | | Mc-Lc/1c-2c | 18 to 84 | |
| 200 | | | Bc-Cc/5c-8c | 78 to 82 | |
| 201 | Ninth Floor | RC Column | Cc/10c | 77 to 80 | |
| 202 | | | Ac-2c | 78 to 86 | |
| 203 | | | Mc/2c | 76 to 82 | |
| 204 | | | Kc/11c | 64 to 71 | |
| 205 | | RC Beam | Ec/11c-12c | 78 to 84 | |
| 206 | | | Bc/2c-3c | 80 to 90 | |
| 207 | | | Lc-Kc/3c | 76 to 82 | |
| 208 | | | Kc-Lc/11c | 70 to 74 | |
| 209 | | RC Slab | Hc-Kc/11c-12c | 78 to 92 | |
| 210 | | | Bc-Cc/5c-8c | 78 to 83 | |
| 211 | Tenth Floor | RC Column | Kc-2c | 76 to 83 | |
| 212 | | | Kc/11c | 74 to 80 | |

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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 213 | Tenth Floor | RC Beam | Bc-Cc/11c | 74 to 80 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 214 | | | Ac-Bc/2c | 75 to 83 | |
| 215 | | | Mc-Lc/2c | 74 to 88 | |
| 216 | | | Lc/10c-11c | 77 to 84 | |
| 217 | | RC Slab | Bc-Cc/5c-8c | 78 to 83 | |
| 218 | | | Cc-Bc/10c-11c | 64 to 72 | |
| 219 | | | Ac-Bc/3c-5c | 72 to 82 | |
| 220 | | | Mc-Lc/1c-2c | 74 to 83 | |
| 221 | | | Lc-Kc/11c-12c | 76 to 90 | |
| 222 | Eleventh Floor | RC Beam | Kc-Lc/1c-2c | 70 to 60 | |
| 223 | | RC Slab | Bc-Cc/5c-8c | 78 to 83 | |
| 224 | | | Mc-Lc/11c-12c | 39 to 48 | |
| 225 | | | Ac-Bc/11c-12c | 56 to 64 | |
| 226 | | | Bc-Cc/5c-3c | 61 to 74 | |
| 227 | Twelfth Floor | RC Column | Cc/9c | 54 to 62 | |
| 228 | | | Ac-2c | 50 to 58 | |
| 229 | | | Mc-2c | 76 to 83 | |
| 230 | | | Kc/11c | 50 to 60 | |
| 231 | | RC Beam | Lc/2c-3c | 52 to 58 | |
| 232 | | RC Slab | Lc-Kc/11c-12c | 28 to 38 | |
| 233 | | | Ac-Bc/11c-12c | 38 to 44 | |
| 234 | | | Ac-Bc/1c-2c | 36 to 42 | |
| 235 | | | Lc-Kc/2c-3c | 39 to 50 | |
| 236 | Thirteenth Floor | RC Column | Ac/11c | 44 to 50 | |
| 237 | | | Kc/11c | 38 to 44 | |
| 238 | | RC Beam | Ac-Bc/2c | 55 to 64 | |
| 239 | | RC Slab | Lc-Kc/11c-12c | 38 to 50 | |
| 240 | | | Ac-Bc/10c-11c | 48 to 54 | |

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|---|---|---|---|---|---|
| 241 | Fourteenth Floor | RC Column | Ac/11c | 74 to 84 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 242 | | | Mc-2c | 48 to 64 | |
| 243 | | | Mc/11c | 56 to 64 | |
| 244 | | RC Beam | Bc-Cc/3c | 51 to 60 | |
| 245 | | RC Slab | Mc-Lc/10c-11c | 48 to 56 | |
| 246 | | | Bc-Cc/10c-11c | 48 to 59 | |
| 247 | | | Ac-Bc/1c-2c | 48 to 58 | |
| 248 | | | Hc-Kc/1c-2c | 35 to 42 | |
| 249 | Fifteenth Floor | RC Column | Kc/11c | 68 to 77 | |
| 250 | | RC Beam | Bc/10c-11c | 61 to 68 | |
| 251 | | RC Slab | Lc-Kc/11c-12c | 65 to 76 | |
| 252 | | | Bc-Cc/11c-12c | 49 to 56 | |
| 253 | Sixteenth Floor | RC Column | Cc/11c | 50 to 60 | |
| 254 | | | Cc/2c | 58 to 67 | |
| 255 | | | Kc/2c | 48 to 54 | |
| 256 | | | Kc-11c | 73 to 84 | |
| 257 | | RC Beam | Bc-Cc/3c | 58 to 64 | |
| 258 | | | Mc-Lc/2c | 51 to 60 | |
| 259 | | RC Slab | Ac-Bc/11c-12c | 46 to 52 | |
| 260 | | | Bc-Cc/1c-2c | 68 to 78 | |
| 261 | | | Lc-Mc/1c-2c | 48 to 54 | |
| 262 | | | Mc-Lc/11c-12c | 34 to 48 | |
| 263 | Seventeenth Floor | RC Column | Cc/10c | 64 to 79 | |
| 264 | | | Cc/3c | 48 to 54 | |
| 265 | | | Mc-11c | 47 to 56 | |
| 266 | | RC Beam | Kc/2c-3c | 47 to 54 | |
| 267 | | RC Slab | Mc-Lc/10c-11c | 34 to 56 | |
| 268 | | | Ac-Bc/11c-12c | 72 to 54 | |
| 269 | | | Ac-Bc/1c-2c | 80 to 86 | |
| 270 | | | Kc-Lc/2c-3c | 47 to 54 | |

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|---|---|---|---|---|---|
| 271 | Eighteenth Floor | RC Column | Cc/11c | 62 to 68 | Refer Resipod Reference Chart For Likelihood Corrosion |
| 272 | | | Mc-11c | 54 to 60 | |
| 273 | | RC Beam | Cc/10c-11c | 70 to 78 | |
| 274 | | | Bc-Cc/2c | 54 to 67 | |
| 275 | | RC Slab | Mc-Lc/11c-12c | 38 to 46 | |
| 276 | | | Bc-Cc/1c-2c | 74 to 80 | |
| 277 | | | Bc-Cc/9c-10c | 70 to 88 | |
| 278 | Nineteenth Floor | RC Column | Mc/2c | 64 to 76 | |
| 279 | | | Kc/10c | 49 to 59 | |
| 280 | | RC Beam | Bc/2c-3c | 54 to 64 | |
| 281 | | RC Slab | Mc-Lc/11c-12c | 43 to 54 | |
| 282 | | | Ac-Bc/1c-2c | 45 to 64 | |
| 283 | | | Kc-Lc/1c-2c | 42 to 53 | |
| 284 | Twentieth Floor | RC Column | Ac/11c | 70 to 78 | |
| 285 | | | Cc/2 | 56 to 64 | |
| 286 | | RC Beam | Mc-Lc/2c | 66 to 74 | |
| 287 | | RC Slab | Kc-Lc/1c-2c | 60 to 67 | |
| 288 | | | Bc-Cc/1c-2c | 47 to 60 | |
| 289 | | | Bc-Cc/10c-11c | 48 to 54 | |
| 290 | Twenty First Floor | RC Column | Cc/3c | 58 to 70 | |
| 291 | | | Mc/2c | 66 to 72 | |
| 292 | | RC Beam | Bc-Cc/10c | 61 to 69 | |
| 293 | | RC Slab | Kc-Lc/1c-2c | 69 to 76 | |
| 294 | Twenty Second Floor | RC Column | Cc/2c | 67 to 75 | |
| 295 | | | Kc/2c | 70 to 80 | |
| 296 | | RC Beam | Bc-Cc/10c | 65 to 70 | |
| 297 | | RC Slab | Mc-Lc/1c-2c | 55 to 68 | |
| 298 | | | Bc-Cc/11c-12c | 70 to 80 | |
| 299 | | | Ac-Bc/1c-2c | 49 to 56 | |

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## REFERENCE LIKELIHOOD OF CORROSION CHART FOR RESIPOD TEST

| | | |
|---|---|---|
| **Equipment** | : | RESIPOD |
| **Make** | : | M/S. Proceq, Switzerland |
| **Technical Reference** | : | 1.RILEM TC 154-EMC: Electrochemical techniques for measuring metallic corrosion.<br>2. Instrument manual furnished by M/S. Proceq, Switzerland |

| Resistivity Measurements | Estimation of the likelihood of corrosion |
|---|---|
| When > 100 kΩcm | Negligible risk of corrosion |
| When = 50 to 100 kΩcm | Low risk of corrosion |
| When= 10 to 50 kΩcm | Moderate risk of corrosion |
| When < 10 kΩcm | High risk of corrosion |

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**TEST REPORT**

TC-6369

Mechanical Testing
Building Materials

Test Order /Report No.BVIPL/CONCRETE CORE: KL/1052/4/2023
Date of Receipt: 11-04-2023

Date: 06/04/2023

*ULR-TC636923000001003F*

**ARMY WELFARE HOUSING ORGANISATION**
C/o Prasanna Vihar, Marine Drive,
Oppo.High Court, Kochi -682031

## TEST REPORT ON CONCRETE CORE TEST

| | | |
|---|---|---|
| Source of sample | : | Sample supplied by the customer |
| Contract No/ Proposal No | : | 17671143/ IND.B.7.2022.300DR-R3 DT.25.10.2022 |
| Customer's Reference | : | B/03029/SSI/job Work/CHN/AWHO Dated 30 –12-2022 |
| Project | : | Structural Stability of Chanderkunj Residential Army Towers of Army Welfare Housing Organisation (AWHO) Located at Silver Sand Island, Vyttila, Kochi Kerala |
| Members tested | : | RC Columns, RC Beams & RC Shear Walls |
| Date of Core Extraction | : | 21/01/2023 to 26/01/2023 |
| Date of test | : | 30.01.2023 |
| Grade of Concrete | : | M30# |
| Reason for Testing | : | To ascertain the quality/ strength of in-situ concrete |
| Age of concrete | : | More than 28 days # |
| Capping Materials Used | : | EP10 Hardner (Part A) & EP10 Base (Part B) From M/s Fosroc Conbextra |
| Condition of sample | : | Satisfactory |
| Test method | : | IS: 516 Part 4: 2018 |

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Tower –B Basement Floor RC Beam Mb/9b-10b | 82.0 | 68.0 | 0.671 | 97.4 | 27.61 | 1.206 | 0.913 | 25.20 | 31.5 | **Typical Compressive Failure** |
| 2 | Tower –B Basement Floor RC Beam Ab/9b-10b | 84.6 | 68.0 | 0.702 | 102.4 | 29.03 | 1.244 | 0.917 | 26.62 | 33.3 | |
| 3 | Tower –B Basement Floor RC Shear wall Eb-Fb/2b-3b | 86.1 | 68.0 | 0.689 | 94.3 | 26.73 | 1.266 | 0.919 | 24.58 | 30.7 | |

Contd....

PRASANTHA KUMAR P.S
Manager-B&I

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**TEST REPORT**

TC-6369

Test Order /Report No.BVIPL/CONCRETE CORE: KL/1052/4/2023
Date of Receipt: 11-04-2023

Date: 06/04/2023

*ULR-TC636923000001083F*

Mechanical Testing
Building Materials

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Tower –B Basement Floor RC Column Cb/1b | 81.7 | 68.0 | 0.674 | 95.0 | 26.93 | 1.201 | 0.912 | 24.57 | 30.7 | Typical Compressive Failure |
| 5 | Tower –B Basement Floor RC Column Cb/12b | 81.7 | 68.0 | 0.688 | 95.9 | 27.19 | 1.201 | 0.912 | 24.80 | 31.0 | |
| 6 | Tower –B Basement Floor RC Column Mb/2b | 88.1 | 58.0 | 0.721 | 90.9 | 25.77 | 1.296 | 0.923 | 23.77 | 29.7 | |
| 7 | Tower –B Basement Floor RC Column Cb/3b | 97.7 | 68.0 | 0.810 | 100.7 | 28.55 | 1,437 | 0.938 | 26.78 | 33.5 | |
| 8 | Tower –B Basement Floor RC Beam Eb/10b-11b | 102.2 | 68.0 | 0,837 | 96.0 | 27.22 | 1.503 | 0.945 | 25.73 | 32.2 | |
| 9 | Tower –B Basement Floor RC Column Lb/1b | 96.3 | 68.0 | 0.784 | 71.6 | 20.30 | 1.416 | 0.936 | 19.0 | 23.7 | |
| 10 | Tower –B Basement Floor RC Column Kb/9b | 99.5 | 68.0 | 0.808 | 80.0 | 22.68 | 1.463 | 0.941 | 21.34 | 26.7 | |
| 11 | Tower –B Basement Floor RC beam 10b/Ab-Bb | 110.0 | 68.0 | 0.909 | 78.5 | 22.25 | 1.618 | 0.958 | 21.32 | 26.6 | |

Contd....

PRASANTHA KUMAR P.S
Manager-B&I

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Ernakulam - 682 028. INDIA
Tel.: +91 484 2414728
Email: cochin.lab@bureauveritas.com

Mechanical Testing
Building Materials

**TEST REPORT**

TC-6369

Test Order /Report No.BVIPL/CONCRETE CORE: KL/1052/4/2023
Date of Receipt: 11-04-2023

Date: 06/04/2023

*ULR-TC636923000001003F*

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Tower –B Basement Floor RC Column 8b/Bb | 108.1 | 68.0 | 0.898 | 89.0 | 25.23 | 1.590 | 0.955 | 24.09 | 30.1 | **Typical Compressive Failure** |
| 13 | Tower –B Basement Floor RC Beam 1b/Fb-Gb | 129.1 | 68.0 | 1.079 | 123.9 | 35.13 | 1.899 | 0.989 | 34.73 | 43.4 | |
| 14 | Tower –B Ground Floor RC Beam 9b-10b/Ab | 91.7 | 68.0 | 0.736 | 82.3 | 23.33 | 1.349 | 0.928 | 21.66 | 27.1 | |
| 15 | Tower –B Ground Floor RC Column Lb/5b | 70.6 | 68.0 | 0.565 | 101.5 | 28.78 | 1.038 | 0.894 | 25.73 | 32.2 | |
| 16 | Tower –B Ground Floor RC Beam Mb/3b-4b | 98.1 | 68.0 | 0.810 | 79.5 | 22.54 | 1.443 | 0.939 | 21.16 | 26.4 | |
| 17 | Tower –B Ground Floor RC Column Kb/1b | 73.3 | 68.0 | 0.568 | 79.2 | 22.45 | 1.078 | 0.899 | 20.18 | 25.2 | |
| 18 | Tower –C Basement Floor RC Column Cc/11c | 73.5 | 68.0 | 0.561 | 68.3 | 19.36 | 1.081 | 0.899 | 17.41 | 21.8 | |
| 19 | Tower –C Basement Floor RC Column 1c/Mc | 109.4 | 68.0 | 0.881 | 72.2 | 20.47 | 1.609 | 0.957 | 19.59 | 24.5 | |
| 20 | Tower –C Basement Floor RC Column Cc/10c | 109.5 | 68.0 | 0.875 | 92.3 | 26.17 | 1.610 | 0.957 | 25.05 | 31.3 | |

Contd....

Reviewed 06/04/23
PRASANTHA KUMAR P.S
Manager-B&I

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Mechanical Testing
Building Materials

TC-6369

## TEST REPORT

Test Order /Report No.BVIPL/CONCRETE CORE: KL/1052/4/2023 Date: 06/04/2023
Date of Receipt: 11-04-2023 Page: 4of 5

*ULR-TC636923000001003F*

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | Tower C Basement Floor RC Column 1c/Bc | 115.6 | 68.0 | 0.938 | 95.0 | 26.93 | 1.700 | 0.967 | 26.04 | 32.6 | |
| 22 | Tower C Basement Floor RC Column Fc/1c | 109.4 | 68.0 | 0.926 | 110.0 | 31.19 | 1.609 | 0.957 | 29.84 | 37.3 | |
| 23 | Tower C Basement Floor RC Column(shear Wall) 10c-11c/Hc | 110.4 | 68.0 | 0.919 | 103.1 | 29.3 | 1.624 | 0.959 | 28.02 | 35.0 | |
| 24 | Tower C Basement Floor RC Column Ac/10c | 104.6 | 68.0 | 0.838 | 86.2 | 24.44 | 1.538 | 0.949 | 23.20 | 29.0 | |
| 25 | Tower C Basement Floor RC Column(Shear Wall) Ec/2c-3c | 112.3 | 68.0 | 0.925 | 70.0 | 19.85 | 1.651 | 0.962 | 19.08 | 23.9 | **Typical Compressive Failure** |
| 26 | Tower C Basement Floor RC Column Cc/10c | 115.5 | 68.0 | 0.930 | 73.4 | 20.81 | 1.699 | 0.967 | 20.12 | 25.1 | |
| 27 | Tower C Basement Floor RC Beam 10c-11c/Cc | 119.5 | 68.0 | 0.976 | 103.0 | 29.20 | 1.757 | 0.973 | 28.42 | 35.5 | |
| 28 | Tower C Basement Floor RC Column Cc/5c | 116.0 | 68.0 | 0.957 | 79.9 | 22.65 | 1.706 | 0.968 | 21.92 | 27.4 | |
| 29 | Tower C Basement Floor RC Column Kc/3c | 118.4 | 68.0 | 0.935 | 79.5 | 22.54 | 1.741 | 0.972 | 21.90 | 27.4 | |

Contd....

PRASANTHA KUMAR P.S
Manager-B&I

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Mechanical Testing
Building Materials

TC-6369

# TEST REPORT

Test Order /Report No.BVIPL/CONCRETE CORE: KL/1052/4/2023
Date of Receipt: 11-04-2023

Date: 06/04/2023

*ULR-TC636923000001003F*

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | Tower C Basement Floor RC Beam Mc/3c-5c | 120.6 | 68.0 | 1.008 | 97.3 | 27.58 | 1.774 | 0.975 | 26.90 | 33.6 | Typical Compressive Failure |
| 31 | Tower C Basement Floor RC Column Kc/6c | 121.4 | 68.0 | 0.994 | 66.8 | 18.94 | 1.785 | 0.976 | 18.49 | 23.1 | |
| 32 | Tower C Basement Floor RC Column 12c/Kc | 128.2 | 68.0 | 1.062 | 81.3 | 23.05 | 1.885 | 0.987 | 22.76 | 28.4 | |
| 33 | Tower C Ground Floor RC Column 12c/Ac | 101.6 | 68.0 | 0.836 | 75.5 | 21.40 | 1.494 | 0.944 | 20.21 | 25.3 | |
| 34 | Tower C Ground Floor RC Beam Ac/8c-10c | 100.1 | 68.0 | 0.819 | 85.7 | 24.30 | 1.472 | 0.942 | 22.89 | 28.6 | |
| 35 | Tower C Ground Floor RC Column 3c/Mc | 102.6 | 68.0 | 0.822 | 102.0 | 28.97 | 1.509 | 0.946 | 27.41 | 34.3 | |
| 36 | Tower C Ground Floor RC Beam 3c-5c/Mc | 107.3 | 68.0 | 0.837 | 26.9 | 21.80 | 1.578 | 0.954 | 20.79 | 26.0 | |
| 37 | Tower C Ground Floor RC Column Lc/10c | 115.4 | 68.0 | 0.937 | 64.0 | 18.14 | 1.697 | 0.967 | 17.54 | 21.9 | |

## Core length and core weight after trimming and capping
###After applying correction factor for diameter of core which is less than 100 mm (i.e. Corrected Core Comp Strength, = Core Comp Strength * 1.06) IS:516-Part 4 :2018,Clause : 8.4.1
+ For l/d ratio, correction factor= 0.11(l/d)+0.78 as per IS:516-Part 4:2018, Clause 8.4.2
++ Equivalent cube compressive strength = 1.25 x corrected cylinder compressive strength as per IS:516-Part 4:2018, Clause 8.4.2

\# As furnished by the customer

**Note** 1. Any correction invalidates this report.

**********

Reviewed 06/04/23
PRASANTHA KUMAR P.S
Manager-B&I

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**TEST REPORT**

TC-6369

Test Order/Report No. BVIPL/CONCRETE CORE: KL/1905/4/2023 Date: 18/04/2023
Date of Receipt: 18-04-2023 Page 1 of 4

*ULR-TC636923000001029F*

**ARMY WELFARE HOUSING ORGANIZATION**
C/o Prasanna Vihar, Marine Drive,
Oppo.High Court, Kochi-682031

Mechanical Testing
Building Materials

## TEST REPORT ON CONCRETE CORE TEST

| | | |
|---|---|---|
| Source Of Sample | : | Sample supplied by the Customer |
| ContractNo/Proposal No | : | 17671143/IND.B.7.2022.300DR-R3 DT.25.10.2022 |
| Customers Reference | : | B/03029/SSI/job Work/CHN/AWHO Dated 30-12-2022 |
| Project# | : | Structural Stability of Chanderkunj Residential Army Towers of Army Welfare Housing Organisation (AWHO) Located at Silver Sand Island, Vyttila, Kochi Kerala |
| Members tested | : | RC Columns, RC Beams , RC Shear Walls& RC Slab |
| Date of Core Extraction | : | 15/02/2023 to 23/02/2023 |
| Date of test | : | 02.03.2023 |
| Grade of Concrete# | : | M30 |
| Reason for Testing | : | To ascertain the quality/ strength of in-situ concrete |
| Age of concrete | : | More than 28 days # |
| Capping Materials Used | : | EP10 Hardner (Part A) & EP10 Base (Part B) From M/s Fosroc Conbextra |
| Condition of Sample | : | Satisfactory |
| Test Method | : | IS: 516 Part 4: 2018 |

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Tower –B 4th floor RC Beam Hb/9b-10b South Side | 110.0 | 68.0 | 0.883 | 57.0 | 16.63 | 1.618 | 0.958 | 15.93 | 19.9 | Typical Compressive Failure |
| 2 | Tower –B 2nd floor RC Beam 5b-8b/Lb | 113.0 | 68.0 | 0.890 | 79.4 | 23.17 | 1.662 | 0.963 | 22.30 | 27.9 | |
| 3 | Tower –B 2nd floor RC Slab 5b-8b/Bb West Side | 117.0 | 68.0 | 0.930 | 77.2 | 22.52 | 1.721 | 0.969 | 21.83 | 27.3 | |

Contd……..

PRASANTHA KUMAR P.S
Manager-B&I

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**TEST REPORT**

TC-6369

Test Order/Report No. BVIPL/CONCRETE CORE: KL/1905/4/2023 Date: 18/04/2023
Date Of Receipt: 18/04/2023 

Mechanical Testing
Building Materials

*ULR-TC636923000001029F*

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Tower –B 2nd floor RC Waist Slab 10b/Hb | 113.0 | 68.0 | 0.907 | 88.3 | 25.76 | 1.662 | 0.963 | 24.80 | 31.0 | Typical Compressive Failure |
| 5 | Tower –B 9th floor RC Shear Wall Hb/9b-10b South Side | 93.0 | 68.0 | 0,744 | 91.9 | 26.81 | 1.368 | 0.930 | 24.95 | 31.2 | |
| 6 | Tower –B 2nd floor RC Slab Kb-Lb/5b-8b East Side | 92.0 | 68.0 | 0.726 | 79.2 | 23.21 | 1.353 | 0.929 | 21.46 | 26.8 | |
| 7 | Tower –B 8th floor RC Slab Cb-Bb/8b-9b West Side | 78.0 | 68.0 | 0.626 | 133.1 | 38.83 | 1.147 | 0.906 | 35.19 | 44 | |
| 8 | Tower –B 6th floor RC Shear Wall South Side | 80.0 | 68.0 | 0.636 | 77.5 | 22.61 | 1.176 | 0.909 | 20.56 | 25.7 | |
| 9 | Tower –B 12th floor RC Shear Wall TB | 70.0 | 68.0 | 0.531 | 106.7 | 31.13 | 1.029 | 0.893 | 27.81 | 34.8 | |
| 10 | Tower –C RC Slab 0204 Lc-Kc/9c-10c | 74.0 | 68.0 | 0.602 | 128.8 | 37.58 | 1.088 | 0.900 | 33.81 | 42.3 | |

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Reviewed 18/04/23

PRASANTHA KUMAR P.S
Manager-B&I

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**TEST REPORT**

TC-6369

Test Order/Report No. BVIPL/CONCRETE CORE: KL/1905/4/2023 Date: 18/04/2023
Date Of Receipt: 18/04/2023 

Mechanical Testing
Building Materials

*ULR-TC636923000001029F*

| SL No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | Tower –C RC Beam 2nd Floor East Side | 82.0 | 68.0 | 0.636 | 74.1 | 21.62 | 1.206 | 0.913 | 19.73 | 24.7 | Typical Compressive Failure |
| 12 | Tower –C RC Beam 2nd Floor West Side | 79.0 | 68.0 | 0.623 | 114.5 | 33.41 | 1.162 | 0.908 | 30.33 | 37.9 | |
| 13 | Tower –C RC Slab 5th Floor East Side | 87.0 | 68.0 | 0.687 | 100.9 | 29.44 | 1.279 | 0.921 | 27.10 | 33.9 | |
| 14 | Tower –C RC Slab 2nd Floor East Side | 103.0 | 68.0 | 0.832 | 75.1 | 21.91 | 1.515 | 0.947 | 20.74 | 25.9 | |
| 15 | Tower –C RC Slab 7th Floor East Side | 101.0 | 68.0 | 0.837 | 100.9 | 29.44 | 1.485 | 0.943 | 27.77 | 34.7 | |
| 16 | Tower –C RC Waist Slab 2nd Floor | 104.0 | 68.0 | 0.825 | 85.3 | 24.89 | 1.529 | 0.948 | 23.60 | 29.5 | |
| 17 | Tower –C RC Column 14th floor 8c/Cc | 107.0 | 68.0 | 0.857 | 58.5 | 17.07 | 1.574 | 0.953 | 16.27 | 20.3 | |

Contd.....

Reviewed 18/04/23

PRASANTHA KUMAR P.S
Manager-B&I

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**TEST REPORT**

TC-6369

Test Order/Report No. BVIPL/CONCRETE CORE: KL/1905/4/2023 Date: 18/04/2023
Date Of Receipt: 18/04/2023 Page No 4 of 4

Mechanical Testing
Building Materials

*ULR-TC636923000001029F*

| Sl. No | Id# | Core length (l) (mm) ## | Core diameter (d) (mm) | Core Weight (kg)## | Max. failure load (kN) | Corrected Core comp. strength (N/sq.mm) ### | l/d Ratio | Correction factor for (l/d) ratio+ | Corrected cylinder comp. strength (N/sq.mm) | Equivalent cube strength++ (N/sq.mm) | Type of failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | Tower –C RC Beam 1203 North Side | 116.0 | 68.0 | 0.911 | 63.2 | 18.44 | 1.706 | 0.968 | 17.84 | 22.3 | Typical Compressive Failure |
| 19 | Tower –C RC Column 5th Floor 6c/Cc | 111.0 | 68.0 | 0.889 | 47.6 | 13.89 | 1.632 | 0.960 | 13.33 | 16.7 | |
| 20 | Tower –C RC Shear Wall 24th Floor Ec/2c-3c | 111.0 | 68.0 | 0.901 | 70.5 | 20.57 | 1.632 | 0.960 | 19.74 | 24.7 | |
| 21 | Tower –C RC Shear Wall 7th Floor Hc/10c-11c | 107.0 | 68.0 | 0.881 | 75.4 | 22.00 | 1.574 | 0.953 | 20.97 | 26.2 | |

## Core length and core weight after trimming and capping
###After applying correction factor for diameter of core which is less than 100 mm (i.e. Corrected Core Comp Strength, = Core Comp Strength * 1.06) IS:516-Part 4 :2018, Clause : 8.4.1
+ For l/d ratio, correction factor= 0.11(l/d)+0.78 as per IS:516-Part 4:2018, Clause 8.4.2
++ Equivalent cube compressive strength = 1.25 x corrected cylinder compressive strength as per IS:516-Part 4:2018, Clause 8.4.2

\# As furnished by the customer
**Note:**1. Any correction invalidates this report.

**for BUREAUVERITAS (INDIA) PRIVATE LIMITED**
**Construction Services Laboratory**

PRASANTHA KUMAR P.S
Manager-B&I

18/04/23

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Tel.: +91 80 23011800
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**TEST REPORT**

TC-9308

Report No.:BVIPL:HC: KL/76/2/2023/1a
Test order dated: 01.02.2023

Date: 17.02.2023

ULR-TC600623100002604F

**CHEMICAL TESTING**
Building Materials

**NDT Division**
Bureau Veritas (India) Private Limited
Building No. 33/1178 F1, New No # CC47/1937 & 47/1938
Kumbalapally Road, Chalikkavattom, Vennala, Cochin, Kerala-682028

## CHEMICAL TEST REPORT ON HARDENED CONCRETE SAMPLES

| | | |
|---|---|---|
| Source of sample | : | Samples collected by BUREAU VERITAS ENGINEERS |
| Letter Reference | : | Letter No B/03029/SSI/Job Work/CHN/AWHO dated 30.12.2022 |
| Condition of samples | : | Satisfactory |
| UIN No. | : | 23004543 |
| No. of samples tested | : | 38 (Thirty Eight) |
| Project # | : | Carrying Out of Structural Assessment and Consultancy for Analysis, NDT, Retrofitting Scheme at AWHO Project SSI, Kochi. |
| Period of test | : | 06.02.2023 to 16.02.2023 |
| Test Method | : | IS: 14959 (Part II) 2001 (Reaffirmed 2021), BS:1881 (Part 124) – 2015 |

| Sl. No. | Identification # | Name of Test | | |
|---|---|---|---|---|
| | | Chloride content - Acid Soluble | | Sulphate as ($SO_3$) (% by mass of cement in concrete mix) |
| | | (% by mass) | (kg/cu.m) $ | |
| 1 | Tower-B, Basement Column Kb-9b | 0.017 | 0.13 | 0.43 |
| 2 | Tower-B, Basement Beam- Ab/9b-10b | 0.024 | 0.17 | 0.22 |
| 3 | Tower-B, Basement Column-cb-1b | 0.017 | 0.12 | 0.41 |
| 4 | Tower-B, Basement Column-Mb-2b | 0.006 | 0.041 | 0.41 |
| 5 | Tower-B, Basement Beam-1b/fb-Gb | 0.007 | 0.051 | 0.13 |
| 6 | Tower-B, Basement Column-CC-10C | 0.010 | 0.068 | 0.11 |
| 7 | Tower-B, Basement Beam-MC-3C/5C | 0.035 | 0.26 | 0.35 |
| 8 | Tower-B, Basement Column-FC-1C | 0.043 | 0.31 | 0.32 |
| 9 | Tower-C Ground Floor Column-3C-MC | 0.005 | 0.037 | 0.33 |
| 10 | Tower-C Ground Floor Column-Lc-10C | 0.005 | 0.034 | 0.43 |
| 11 | Tower-B Basement Beam-9b-10b/mb | 0.005 | 0.034 | 0.11 |
| 12 | Tower-B Basement Column-Eb-Fb/2b-3b (shear wall) | 0.002 | 0.014 | 0.12 |
| 13 | Tower-B Basement Column-cb-12b | 0.005 | 0.034 | 0.13 |
| 14 | Tower-B Basement Column-cb-3b | 0.005 | 0.034 | 0.11 |
| 15 | Tower-B Basement Beam-Eb/10b-11b | 0.006 | 0.041 | 0.14 |
| 16 | Tower-B Basement Column-Lb-1b | 0.010 | 0.068 | 0.11 |
| 17 | Tower-B Basement Beam-10b/Ab-Bb | 0.007 | 0.051 | 0.12 |
| 18 | Tower-B Basement Column-8b-Bb | 0.005 | 0.034 | 0.13 |
| 19 | Tower-B Ground Floor Beam-9b-10b/Ab | 0.038 | 0.27 | 0.21 |
| 20 | Tower-B Ground Floor Column-Lb-5b | 0.002 | 0.017 | 0.12 |

17/02/2023

**BHAGWAN. S**
Assistant Manager - Chemical Lab

Contd.....

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**TEST REPORT**

TC4056

Report No.:BVIPL:HC: KL/76/2/2023/1a
Test order dated: 01.02.2023

Date: 17.02.2023

ULR-TC600623100002604F

## CHEMICAL TESTING

### Building Materials

| SL No. | Identification # | Name of Test | | |
|---|---|---|---|---|
| | | Chloride content - Acid Soluble | | Sulphate as ($SO_3$) (% by mass of cement in concrete mix) |
| | | (% by mass) | (kg/cu.m) $ | |
| 21 | Tower-B Ground Floor Beam-Mb/3b-4b | 0.006 | 0.041 | 0.11 |
| 22 | Tower-B Ground Floor Column-kb-1b | 0.012 | 0.085 | 0.12 |
| 23 | Tower-B Main staircase Waist slab Gf -ff | 0.113 | 0.82 | 0.51 |
| 24 | Tower-C Basement Column-Ec-2c/3c (shear wall) | 0.008 | 0.058 | 0.42 |
| 25 | Tower-C Basement Column 1C-BC | 0.059 | 0.43 | 0.34 |
| 26 | Tower-C Basement Column-CC-12C | 0.017 | 0.12 | 0.31 |
| 27 | Tower-C Basement Column-CC-5C | 0.047 | 1.12 | 0.31 |
| 28 | Tower-C Basement Column-CC-11C | 0.024 | 0.17 | 0.21 |
| 29 | Tower-C Basement Column-KC-6C | 0.024 | 0.17 | 0.31 |
| 30 | Tower-C Basement Column-12c/Kc | 0.012 | 0.085 | 0.12 |
| 31 | Tower-C Basement Column-10C-11C/HC (shear wall) | 0.006 | 0.041 | 0.20 |
| 32 | Tower-C Ground Floor Beam-Ac/8C-10C | 0.036 | 0.26 | 0.49 |
| 33 | Tower-C Ground Floor Column-12C/AC | 0.010 | 0.068 | 0.32 |
| 34 | Tower-C Ground Floor Beam-3C-5C/Mc | 0.029 | 0.21 | 0.42 |
| 35 | Tower-C Ground Floor Column-1C-MC | 0.008 | 0.058 | 0.24 |
| 36 | Tower-C Ground Floor Beam-10C-11C/CC | 0.006 | 0.041 | 0.28 |
| 37 | Tower-C Ground Floor Column-Kc-3C | 0.012 | 0.085 | 0.35 |
| 38 | Tower-C Ground Floor Column-AC-10C | 0.047 | 0.34 | 0.45 |
| **Requirements as per IS:456-2000 (Reaffirmed in 2021)** | | ----- | **For reinforced concrete or plain concrete containing embedded metal, max. acid soluble chloride content in concrete should not exceed 0.6 kg/cu.m.** | **Total water-soluble sulphate content as $SO_3$ should not exceed 4% by mass of cement in the concrete mix.** |

**$ Chloride Content is Calculated by taking average density of Hardened Concrete as 2400 kg/Cu.m**
**#** As furnished by the customer

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**for BUREAU VERITAS (INDIA) PRIVATE LIMITED**
**Construction Services Laboratory**

17/02/2023

**BHAGWAN. S**
Assistant Manager - Chemical Lab

****END OF THE REPORT****

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Report No.:BVIPL:HC: KL/76/2/2023/1b
Test order dated: 01.02.2023

Date: 17.02.2023


**NDT Division**
Bureau Veritas (India) Private Limited
Building No. 33/1178 F1, New No # CC47/1937 & 47/1938
Kumbalapally Road, Chalikkavattom, Vennala, Cochin, Kerala-682028

## CHEMICAL TEST REPORT ON HARDENED CONCRETE SAMPLES

Source of sample : Samples collected by BUREAU VERITAS ENGINEERS
Letter Reference : Letter No B/03029/SSI/Job Work/CHN/AWHO dated 30.12.2022
Condition of samples : Satisfactory
UIN No. : 23004543
No. of samples tested : 38 (Thirty Eight)
Project # : Carrying Out of Structural Assessment and Consultancy for Analysis, NDT, Retrofitting Scheme at AWHO Project SSI, Kochi.
Period of test : 06.02.2023 to 16.02.2023
Test Method : Laboratory Developed Method (BVIPL/CHEM/SOP/Concrete pH)

| Sl. No. | Identification # | Name of Test |
|---|---|---|
| | | pH |
| 1 | Tower-B, Basement Column Kb-9b | 13.68 |
| 2 | Tower-B, Basement Beam- Ab/9b-10b | 13.61 |
| 3 | Tower-B, Basement Column-cb-1b | 13.81 |
| 4 | Tower-B, Basement Column-Mb-2b | 13.74 |
| 5 | Tower-B, Basement Beam-1b/fb-Gb | 13.75 |
| 6 | Tower-B, Basement Column-CC-10C | 13.75 |
| 7 | Tower-B, Basement Beam-MC-3C/5C | 13.78 |
| 8 | Tower-B, Basement Column-FC-1C | 13.64 |
| 9 | Tower-C Ground Floor Column-3C-MC | 13.79 |
| 10 | Tower-C Ground Floor Column-Lc-10C | 13.78 |
| 11 | Tower-B Basement Beam-9b-10b/mb | 13.82 |
| 12 | Tower-B Basement Column-Eb-Fb/2b-3b (shear wall) | 13.88 |
| 13 | Tower-B Basement Column-cb-12b | 13.86 |
| 14 | Tower-B Basement Column-cb-3b | 13.79 |
| 15 | Tower-B Basement Beam-Eb/10b-11b | 13.85 |
| 16 | Tower-B Basement Column-Lb-1b | 13.81 |
| 17 | Tower-B Basement Beam-10b/Ab-Bb | 13.84 |
| 18 | Tower-B Basement Column-8b-Bb | 13.82 |
| 19 | Tower-B Ground Floor Beam-9b-10b/Ab | 13.85 |
| 20 | Tower-B Ground Floor Column-Lb-5b | 13.84 |

17/02/2023

**BHAGWAN. S**
Assistant Manager - Chemical Lab

Contd.....

Report No.:BVIPL:HC: KL/76/2/2023/1b
Test order dated: 01.02.2023

Date: 17.02.2023


| Sl. No. | Identification # | Name of Test |
|---|---|---|
| | | pH |
| 21 | Tower-B Ground Floor Beam-Mb/3b-4b | 13.85 |
| 22 | Tower-B Ground Floor Column-kb-1b | 13.86 |
| 23 | Tower-B Main staircase Waist slab Gf -ff | 13.22 |
| 24 | Tower-C Basement Column-Ec-2c/3c (shear wall) | 13.83 |
| 25 | Tower-C Basement Column 1C-BC | 13.86 |
| 26 | Tower-C Basement Column-CC-12C | 13.89 |
| 27 | Tower-C Basement Column-CC-5C | 13.89 |
| 28 | Tower-C Basement Column-CC-11C | 13.85 |
| 29 | Tower-C Basement Column-KC-6C | 13.92 |
| 30 | Tower-C Basement Column-12c/Kc | 13.87 |
| 31 | Tower-C Basement Column-10C-11C/HC (shear wall) | 13.92 |
| 32 | Tower-C Ground Floor Beam-Ac/8C-10C | 13.90 |
| 33 | Tower-C Ground Floor Column-12C/AC | 13.80 |
| 34 | Tower-C Ground Floor Beam-3C-5C/Mc | 13.88 |
| 35 | Tower-C Ground Floor Column-1C-MC | 13.88 |
| 36 | Tower-C Ground Floor Beam-10C-11C/CC | 13.90 |
| 37 | Tower-C Ground Floor Column-Kc-3C | 13.85 |
| 38 | Tower-C Ground Floor Column-AC-10C | 13.85 |

# As furnished by the customer

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**for BUREAU VERITAS (INDIA) PRIVATE LIMITED**
**Construction Services Laboratory**

17/02/2023
**BHAGWAN. S**
Assistant Manager - Chemical Lab

**END OF THE REPORT**

Bureau Veritas (India) Private Limited
*Construction Services Laboratory*
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**TEST REPORT**

TC-8306

Report No.:BVIPL:HC: KL/252/3/2023/1a
Test order dated: 02.03.2023

Date: 21.03.2023


**NDT Division**
Bureau Veritas (India) Private Limited
Building No. 33/1178 F1, New No # CC47/1937 & 47/1938
Kumbalapally Road, Chalikkavattom, Vennala, Cochin, Kerala-682028

**CHEMICAL TESTING**
Building Materials

## CHEMICAL TEST REPORT ON HARDENED CONCRETE

| | | |
|---|---|---|
| Source of sample | : | Samples collected by BUREAU VERITAS ENGINEERS |
| Letter Reference | : | Email dated 01.03.2023 & 23.03.2023 |
| Condition of samples | : | Satisfactory |
| UIN No. | : | 23009548 |
| No. of samples tested | : | 21(Twenty one) |
| Project | : | Not Furnished |
| Period of test | : | 10.03.2023 to 18.03.2023 |
| Test Method | : | IS: 14959 (Part II) 2001 (Reaffirmed 2021) and BS: 1881 (Part 124) – 2015 |

| Sl. No. | Identification # | Name of Test | | |
|---|---|---|---|---|
| | | Chloride content - Acid Soluble | | Sulphate as ($SO_3$) (% by mass of cement in concrete mix) |
| | | (% by mass) | (kg/cu.m) $ | |
| 1 | Tower C RC Slab C0204 – Lc–Kc/9c-10c | 0.026 | 0.63 | 0.11 |
| 2 | Tower C RC Slab East side – 7th floor | 0.011 | 0.26 | 0.22 |
| 3 | Tower C RC Slab East side 5th floor | 0.005 | 0.12 | 0.17 |
| 4 | Tower C RC Beam East side 2nd floor | 0.018 | 0.42 | 0.21 |
| 5 | Tower C RC Slab East side Second floor | 0.038 | 0.91 | 0.14 |
| 6 | Tower C RC Shearwall 7th floor – He/10c-11c | 0.004 | 0.10 | 0.23 |
| 7 | Tower C RC Waist Slab – 2nd floor | 0.037 | 0.88 | 0.12 |
| 8 | Tower C RC Column 14th floor Cc/8c | 0.004 | 0.10 | 0.19 |
| 9 | Tower C RC Column 5th floor – Cc/6c | 0.005 | 0.11 | 0.32 |
| 10 | Tower C RC Shearwall – 24th floor – Ec/2c-3c | 0.005 | 0.11 | 0.28 |
| 11 | Tower C RC Beam West side 2nd floor | 0.025 | 0.60 | 0.13 |
| 12 | Tower C RC Beam 1203 North side | 0.004 | 0.10 | 0.38 |
| 13 | Tower B RC Beam 4th floor South side – Hb/9b-10b | 0.021 | 0.50 | 0.18 |
| 14 | Tower B RC Slab 2nd floor West side 5b-8b/Bb | 0.024 | 0.58 | 0.13 |

21/03/2023

**BHAGWAN. S**
Assistant Manager - Chemical Lab

Contd.....

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Bangalore - 560 079. INDIA
Tel.: +91 80 23011800
Email: bangalore.lab@bureauveritas.com

**TEST REPORT**

Report No.:BVIPL:HC: KL/252/3/2023/1a
Test order dated: 02.03.2023

Date: 21.03.2023


## CHEMICAL TESTING
### Building Materials

| Sl. No. | Identification # | Name of Test | | |
|---|---|---|---|---|
| | | Chloride content - Acid Soluble | | Sulphate as ($SO_3$) (% by mass of cement in concrete mix) |
| | | (% by mass) | (kg/cu.m) $ | |
| 15 | Tower B RC Slab 8th floor West side Cb-Bb/9b-8b | 0.029 | 0.70 | 0.12 |
| 16 | Tower B RC Shear Wall 9th floor South side – Hb/9b-10b | 0.020 | 0.49 | 0.15 |
| 17 | Tower B RC Slab 2nd floor East side balcony – Kb-Lb/5b-8b | 0.045 | 1.08 | 0.11 |
| 18 | Tower B RC Shear wall 12th floor - TB | 0.012 | 0.28 | 0.14 |
| 19 | Tower B RC Beam 2nd floor 5b-8b/Lb | 0.018 | 0.43 | 0.14 |
| 20 | Tower B RC Waist Slab 2nd floor – 10b/Hb | 0.020 | 0.47 | 0.19 |
| 21 | Tower B 6th floor South side RC Shear Wall-10b-11b/Eb | 0.010 | 0.24 | 0.13 |
| **Requirements as per IS:456-2000 (Reaffirmed in 2021)** | | ------- | **For reinforced concrete or plain concrete containing embedded metal, max. acid soluble chloride content in concrete should not exceed 0.6 kg/cu.m.** | **Total water-soluble sulphate content as $SO_3$ should not exceed 4% by mass of cement in the concrete mix.** |

**$ Chloride Content is Calculated by taking average density of Hardened Concrete as 2400 kg/Cu.m**

# As furnished by the customer

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**for BUREAU VERITAS (INDIA) PRIVATE LIMITED**
**Construction Services Laboratory**

21/03/2023
**BHAGWAN. S**
Assistant Manager - Chemical Lab

****END OF THE REPORT****

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Report No.:BVIPL:HC: KL/252/3/2023/1b
Test order dated: 02.03.2023

Date: 21.03.2023


**NDT Division**
Bureau Veritas (India) Private Limited
Building No. 33/1178 Fl, New No # CC47/1937 & 47/1938
Kumbalapally Road, Chalikkavattom, Vennala, Cochin, Kerala-682028

## CHEMICAL TEST REPORT ON HARDENED CONCRETE SAMPLES

| | | |
|---|---|---|
| Source of sample | : | Samples collected by BUREAU VERITAS ENGINEERS |
| Letter Reference | : | Email dated 01.03.2023 & 23.03.2023 |
| Condition of samples | : | Satisfactory |
| UIN No. | : | 23009548 |
| No. of samples tested | : | 21(Twenty one) |
| Project | : | Not Furnished |
| Period of test | : | 10.03.2023 to 18.03.2023 |
| Test Method | : | Laboratory Developed Method (BVIPL/CHEM/SOP/Concrete pH) |

| Sl. No. | Identification # | Name of Test |
|---|---|---|
| | | pH |
| 1 | Tower C RC Slab C0204 – Lc-Kc/9c-10c | 13.44 |
| 2 | Tower C RC Slab East side – 7th floor | 13.46 |
| 3 | Tower C RC Slab East side 5th floor | 13.37 |
| 4 | Tower C RC Beam East side 2nd floor | 13.45 |
| 5 | Tower C RC Slab East side Second floor | 13.21 |
| 6 | Tower C RC Shearwall 7th floor – Hc/10c-11c | 13.43 |
| 7 | Tower C RC Waist Slab – 2nd floor | 13.51 |
| 8 | Tower C RC Column 14th floor Cc/8c | 13.47 |
| 9 | Tower C RC Column 5th floor – Cc/6c | 13.93 |
| 10 | Tower C RC Shearwall – 24th floor – Ec/2c-3c | 13.49 |
| 11 | Tower C RC Beam West side 2nd floor | 13.37 |
| 12 | Tower C RC Beam 1203 North side | 13.38 |
| 13 | Tower B RC Beam 4th floor South side – Hb/9b-10b | 13.43 |
| 14 | Tower B RC Slab 2nd floor West side 5b-8b/Bb | 13.46 |
| 15 | Tower B RC Slab 8th floor West side Cb-Bb/9b-8b | 13.33 |
| 16 | Tower B RC Shear Wall 9th floor South side – Hb/9b-10b | 13.36 |
| 17 | Tower B RC Slab 2nd floor East side balcony – Kb-Lb/5b-8b | 13.31 |
| 18 | Tower B RC Shear wall 12th floor - TB | 13.40 |
| 19 | Tower B RC Beam 2nd floor 5b-8b/Lb | 13.02 |
| 20 | Tower B RC Waist Slab 2nd floor – 10b/Hb | 13.46 |
| 21 | Tower B 6th floor South side RC Shear Wall-10b-11b/Eb | 13.32 |

# As furnished by the customer

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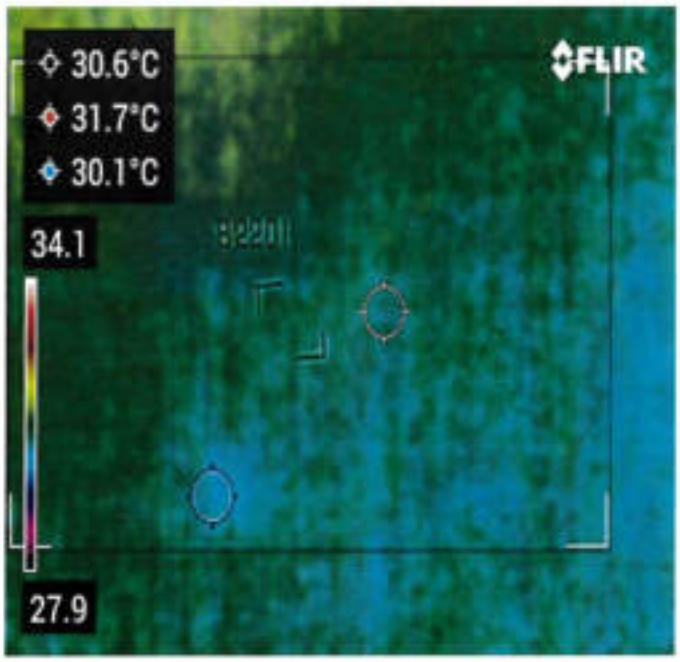
**for BUREAU VERITAS (INDIA) PRIVATE LIMITED**
**Construction Services Laboratory**

21/03/2023

****END OF THE REPORT****

**BHAGWAN. S**
Asst. Manager - Chemical Lab

## THERMOGRAPHY IMAGES



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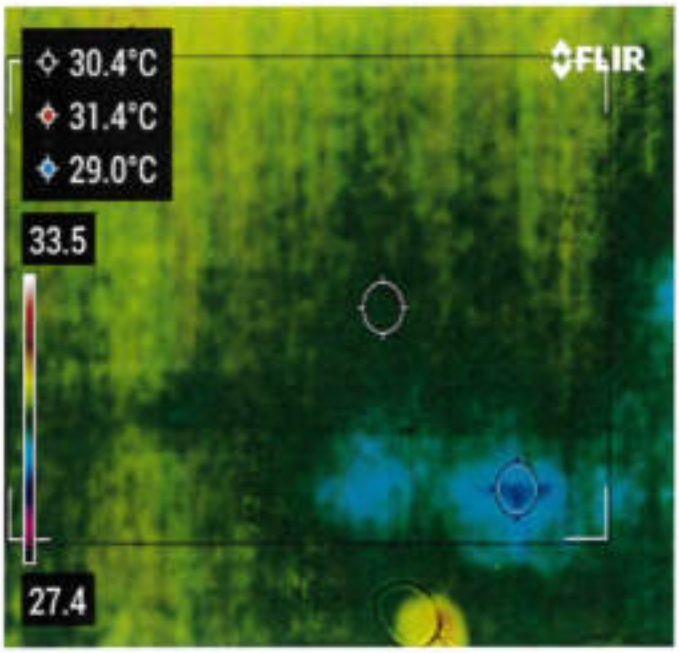

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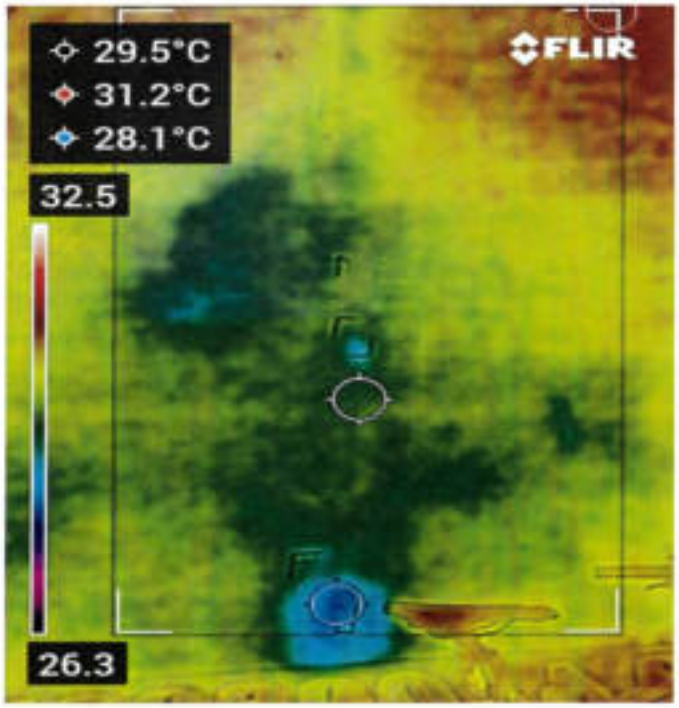
## THERMOGRAPHY IMAGES



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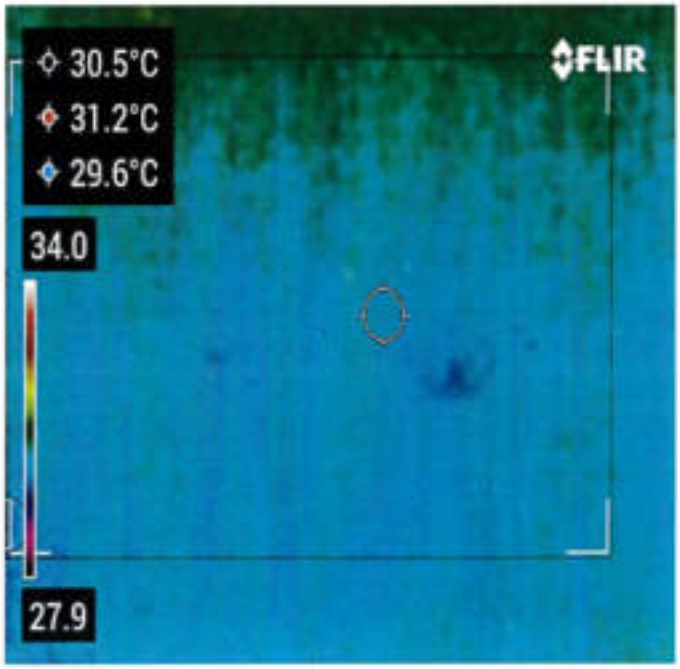

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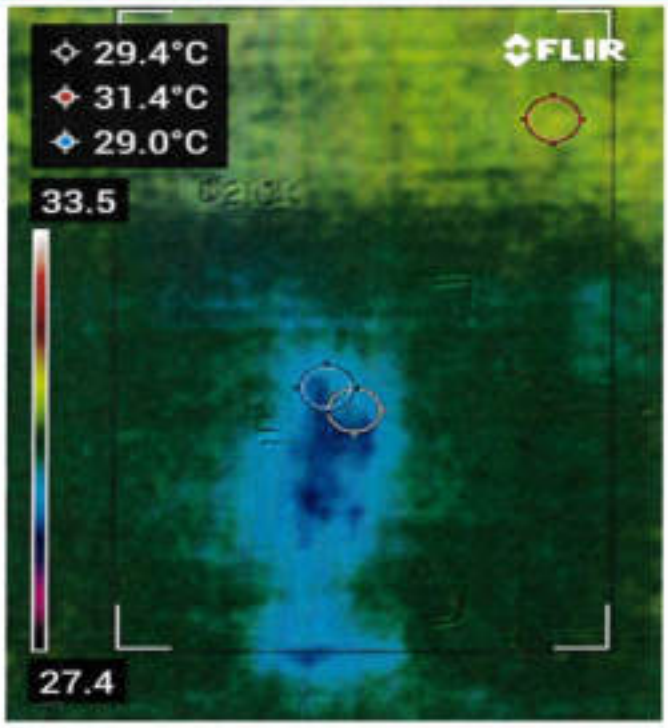
## THERMOGRAPHY IMAGES



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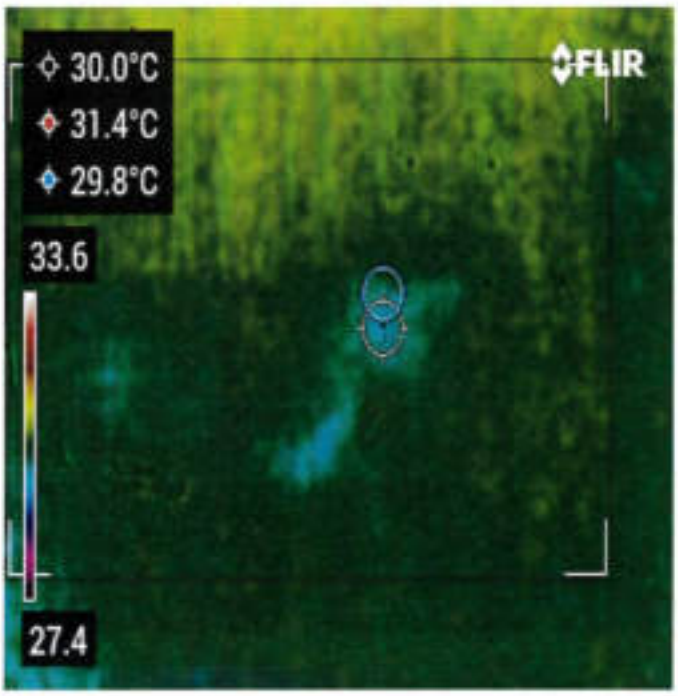

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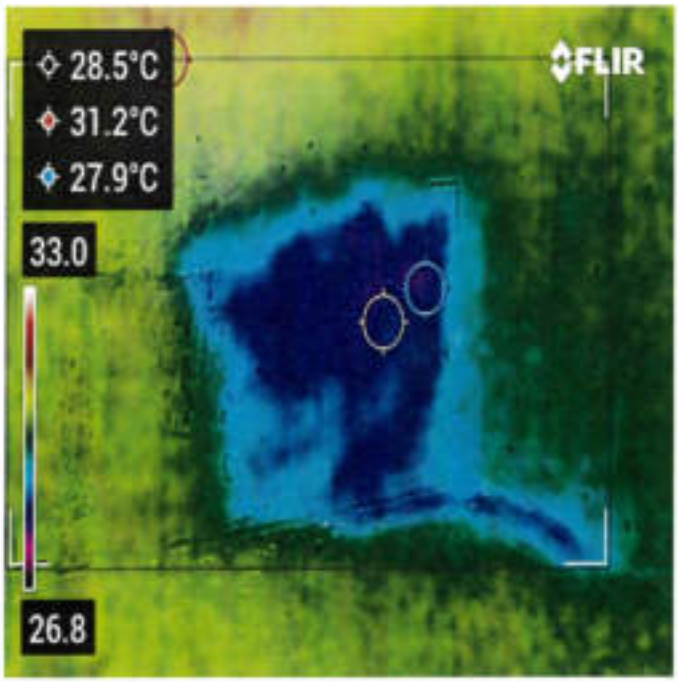
## THERMOGRAPHY IMAGES



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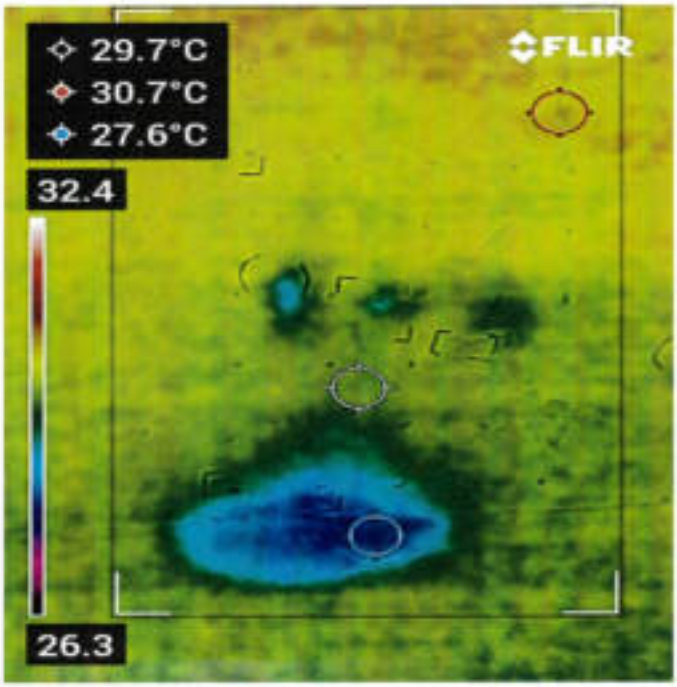

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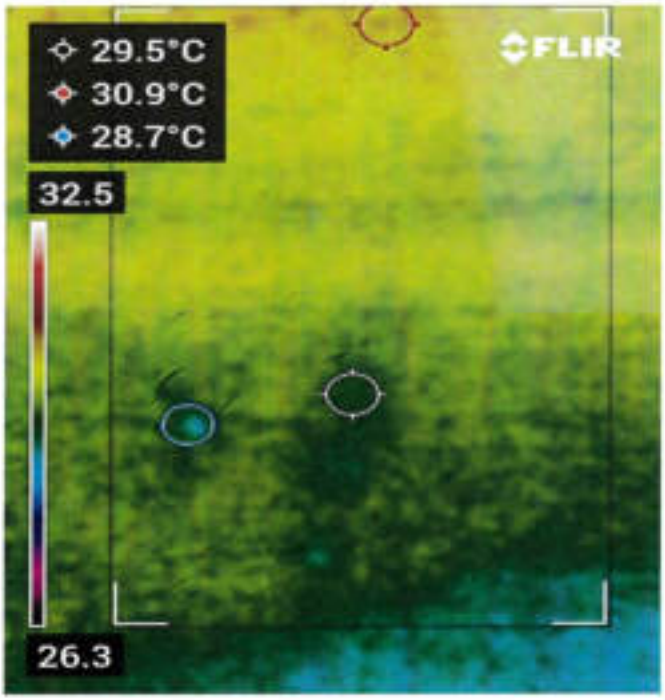

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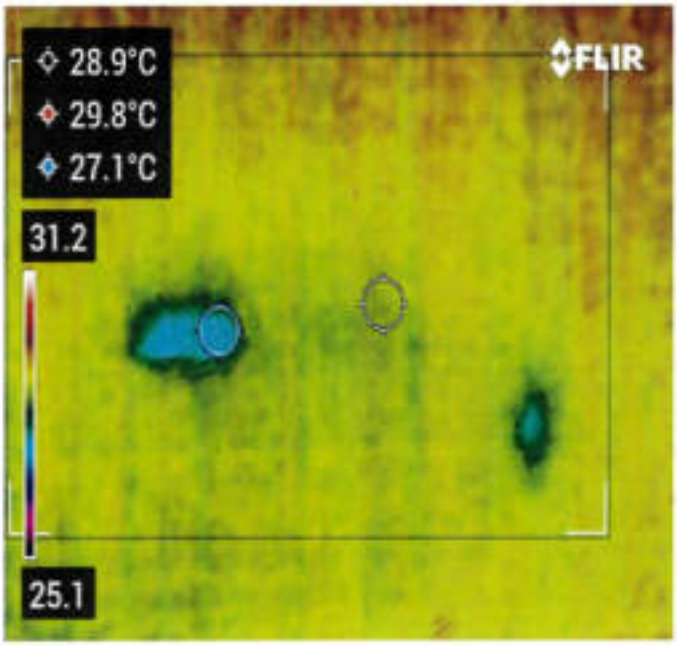

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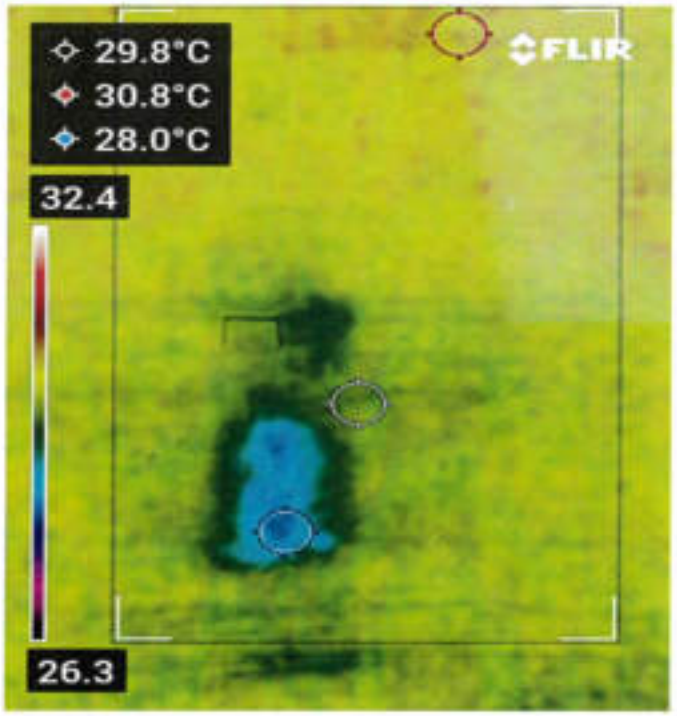
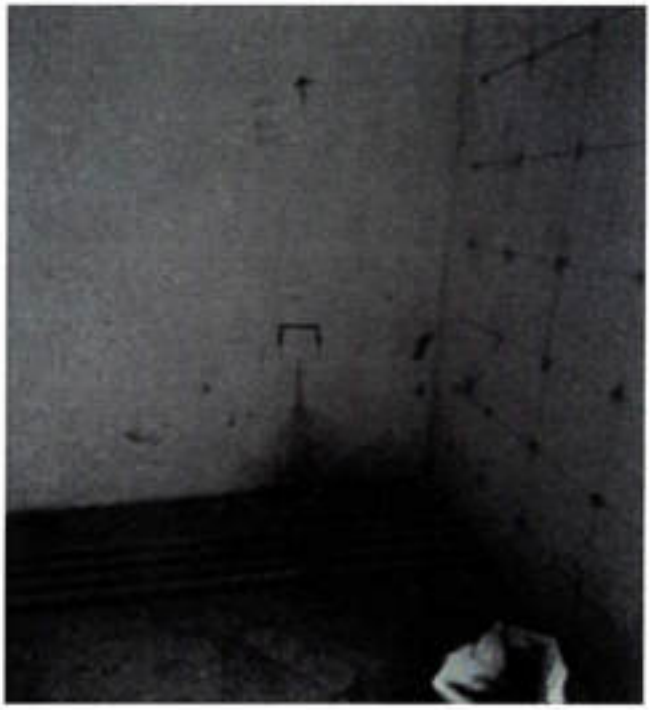
## THERMOGRAPHY IMAGES



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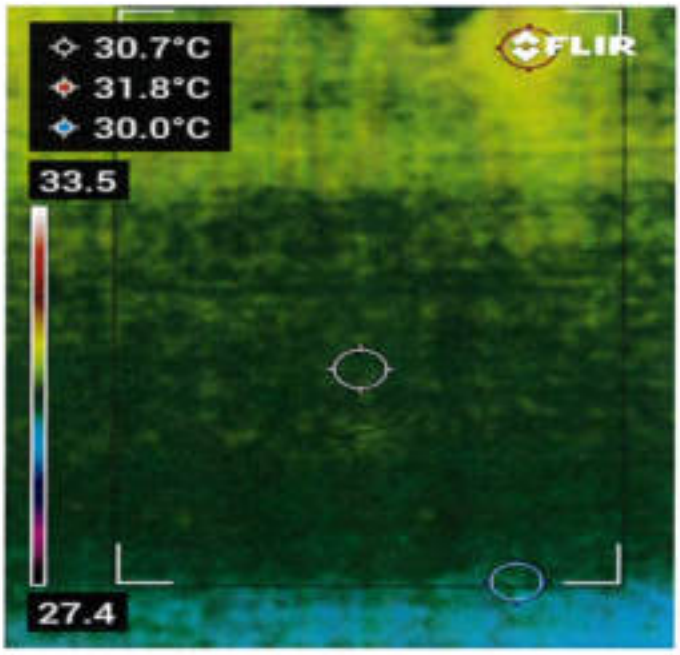

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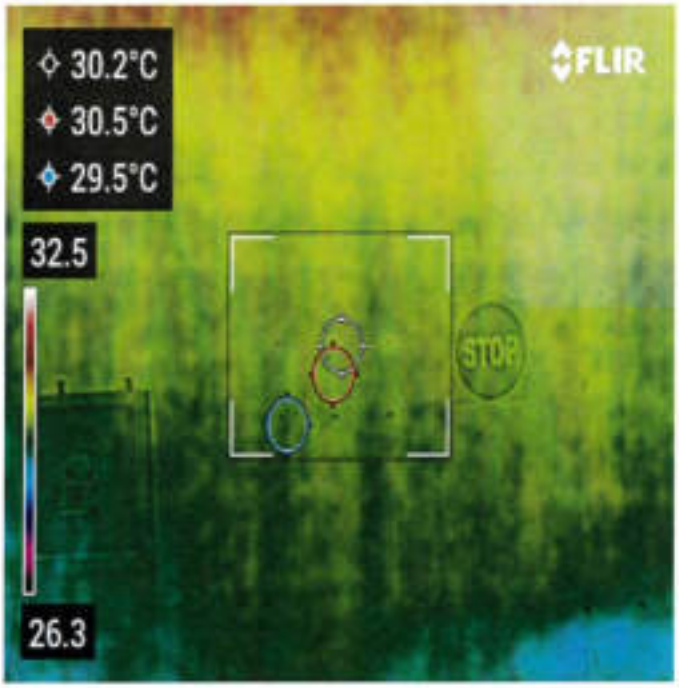

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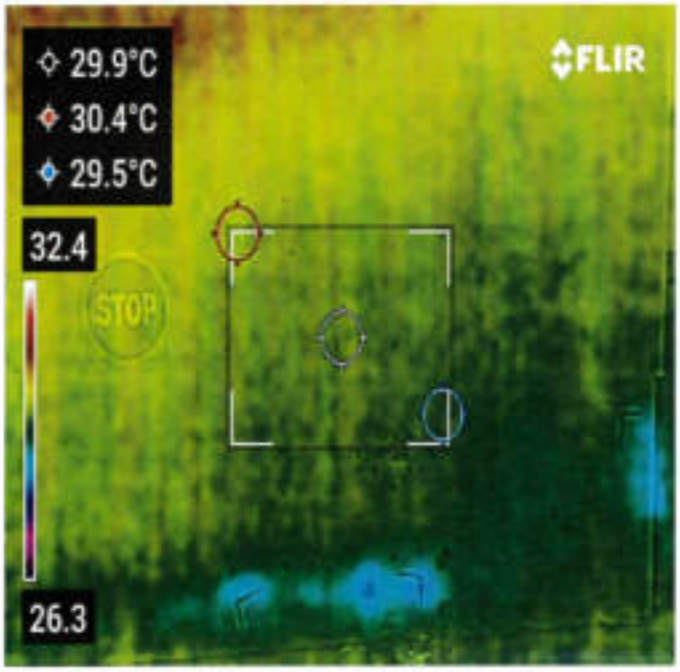

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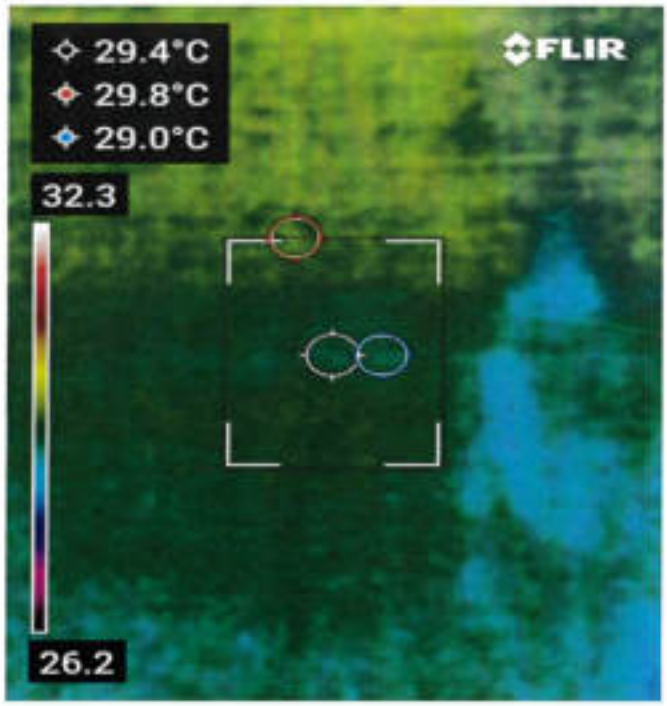

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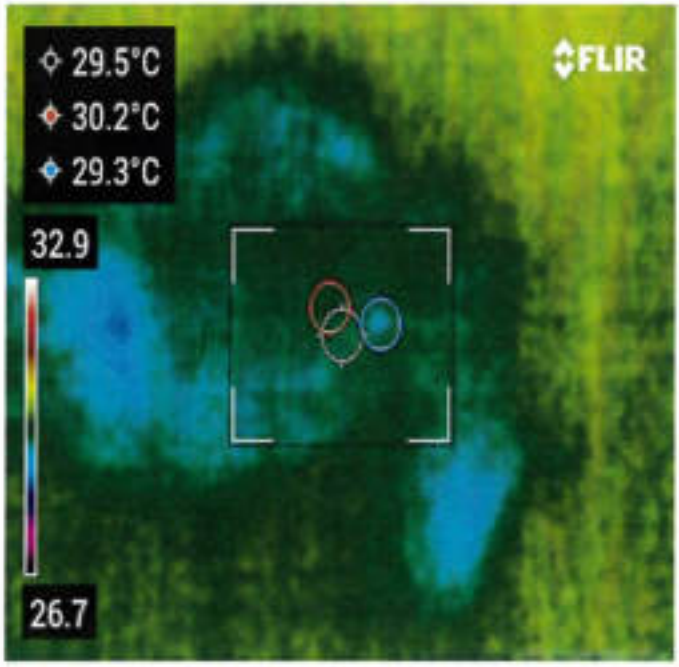

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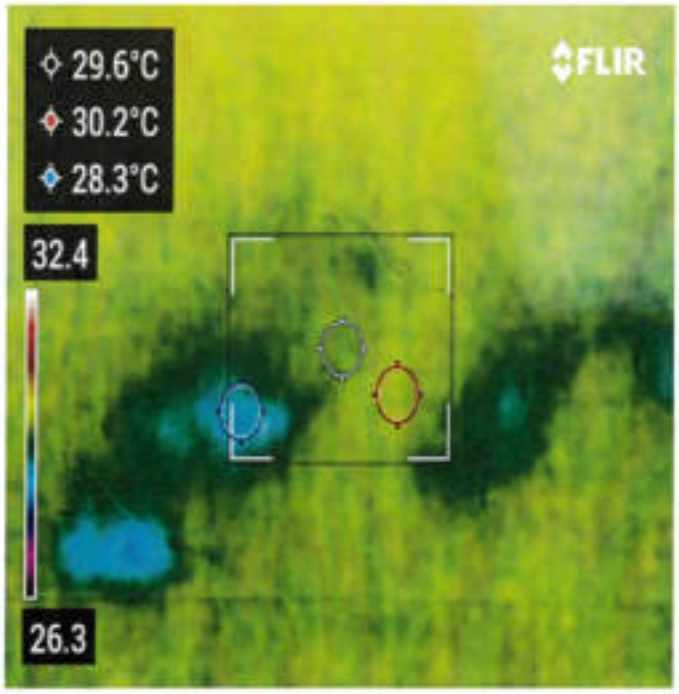

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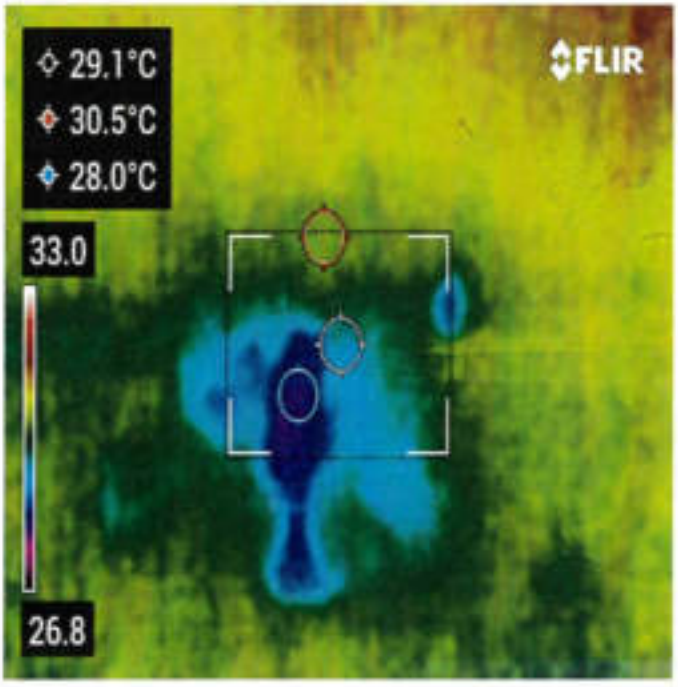

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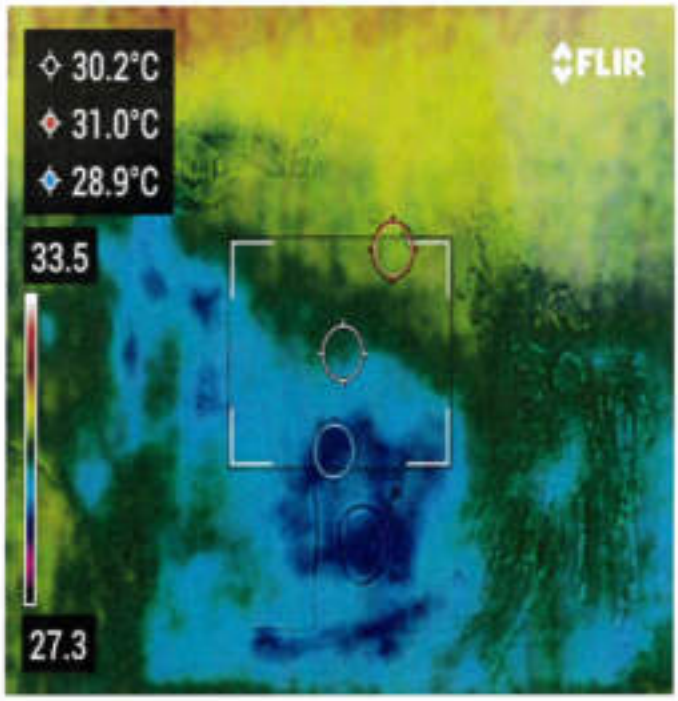

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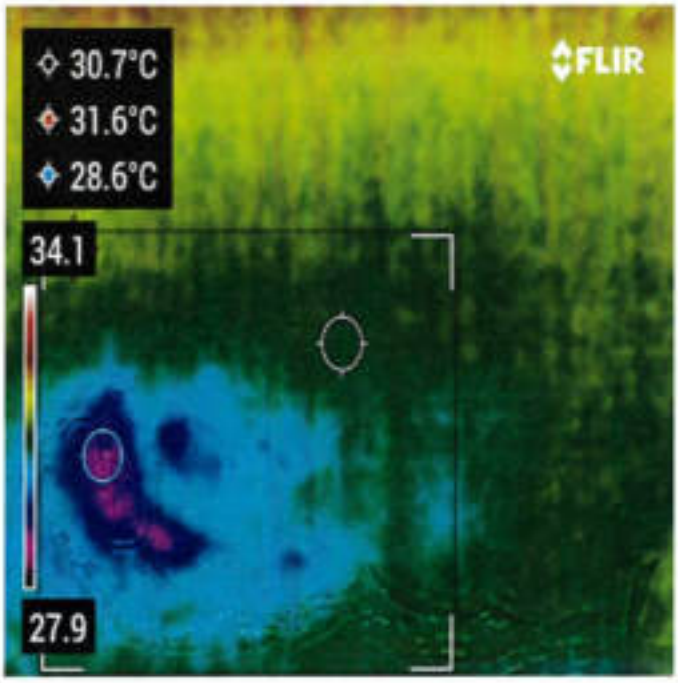

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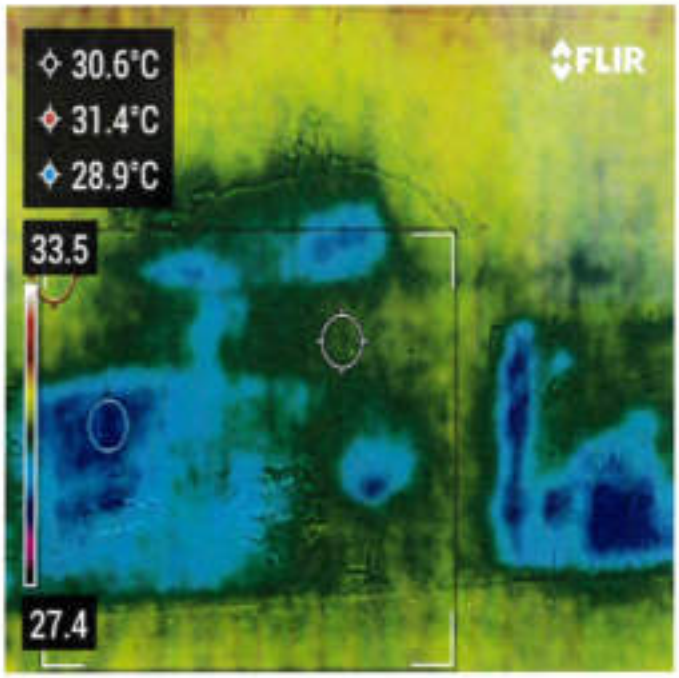

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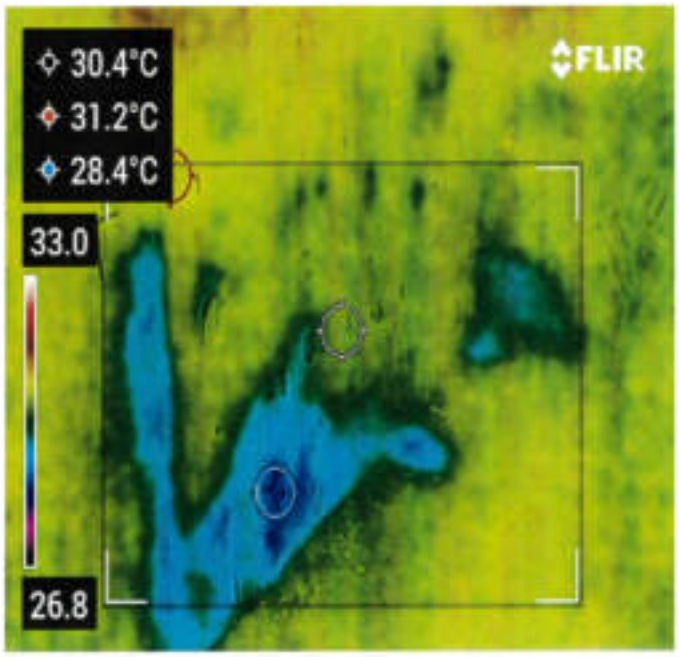

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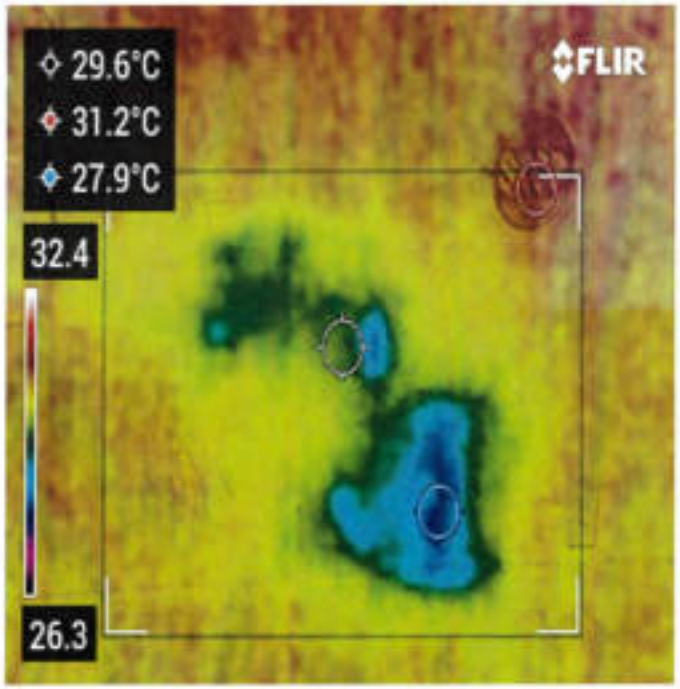
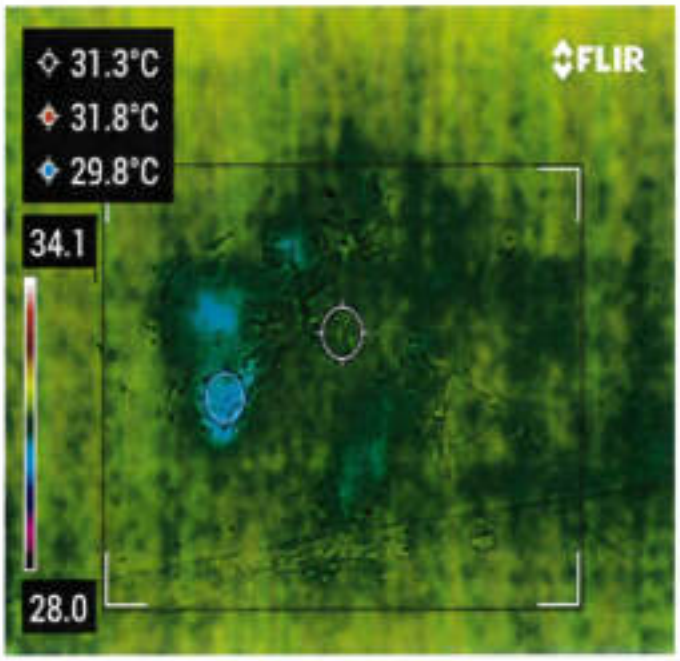


Grid - Fd-Gd/1d



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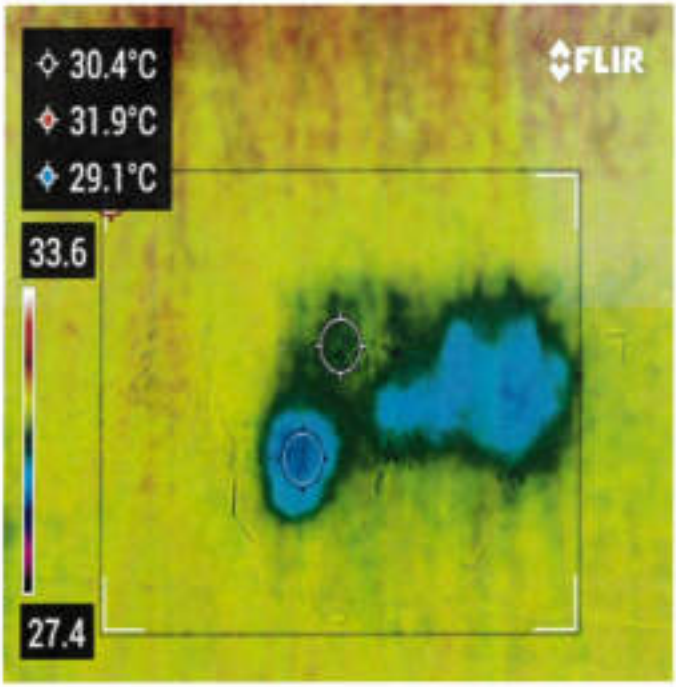
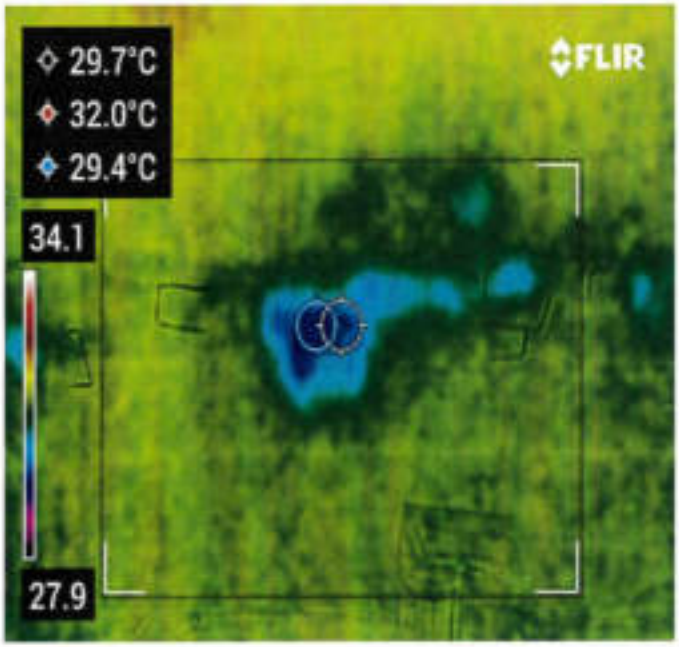


Grid - Kd/1d-2d



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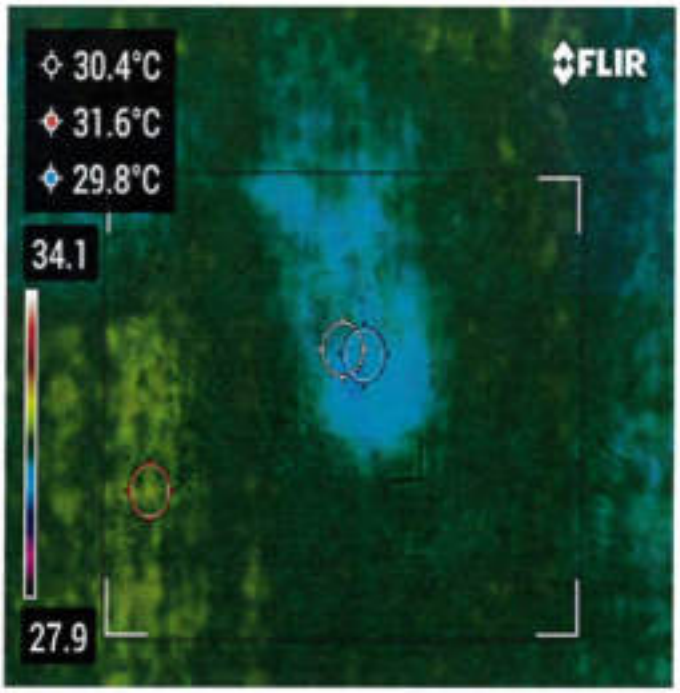
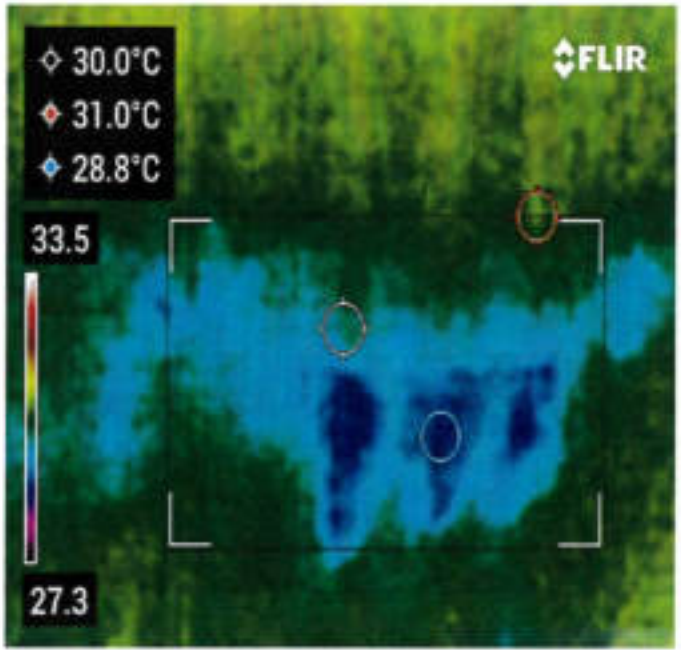


Grid - Kd/4d-5d



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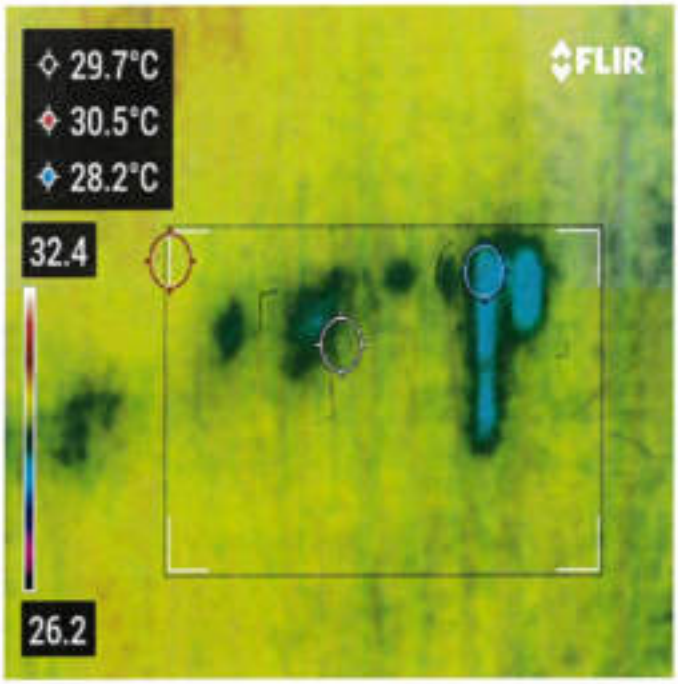
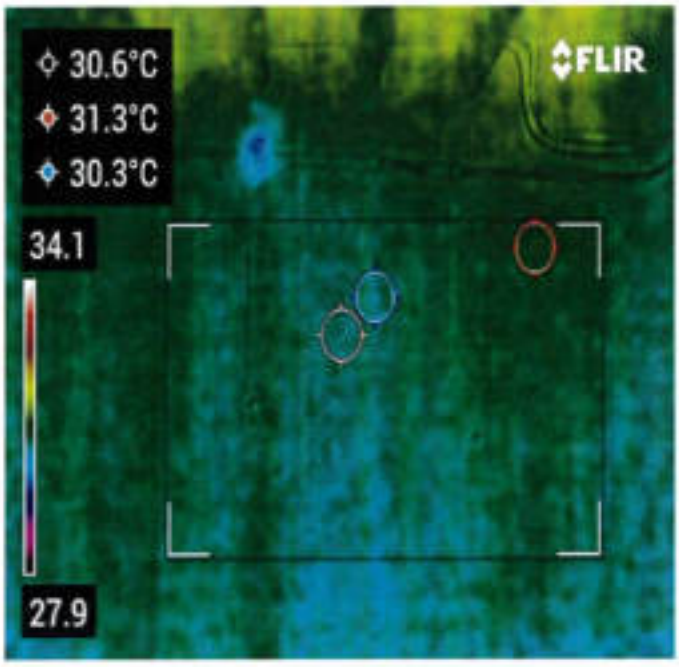
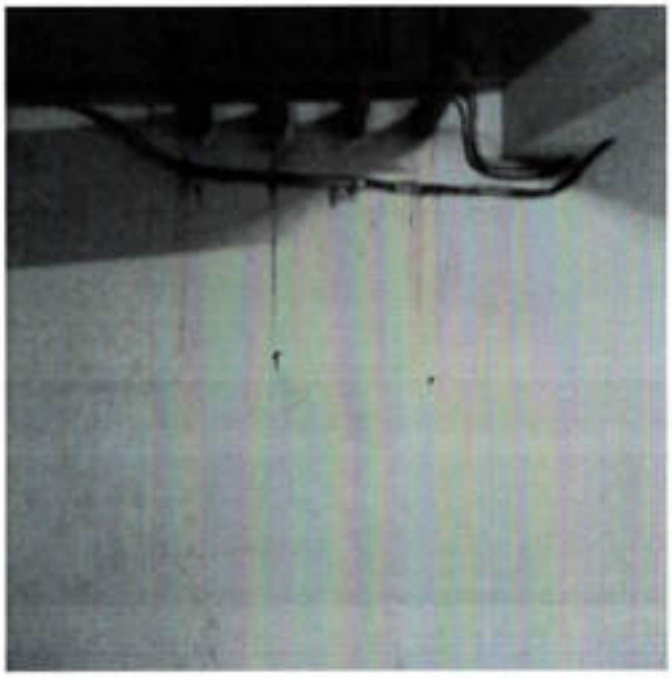


**Grid - b/w Nd-Pd**



**Grid - b/w Rd-Sd**

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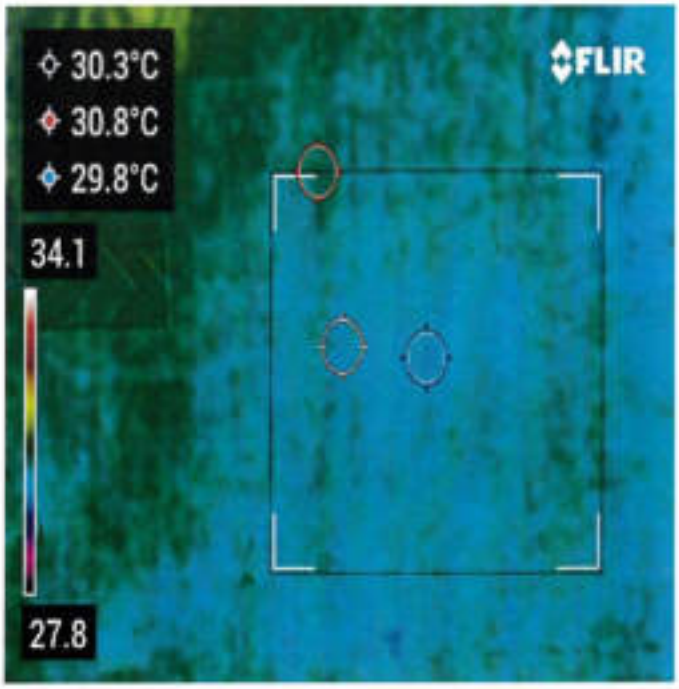
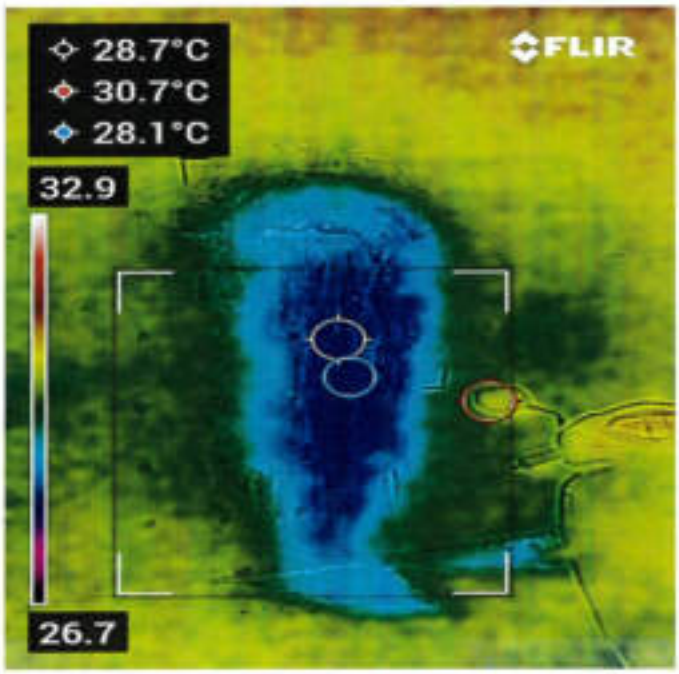
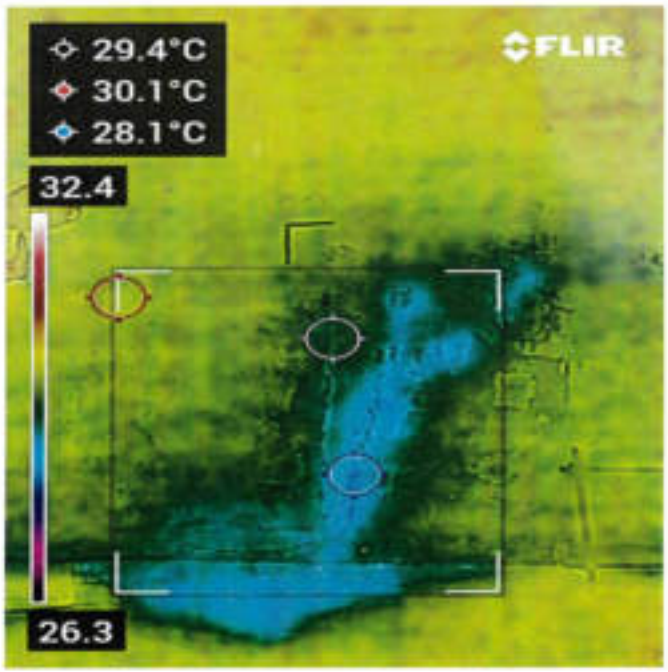


Grid - b/w Rd-Sd



Grid - b/w Sd-Td

## THERMOGRAPHY IMAGES



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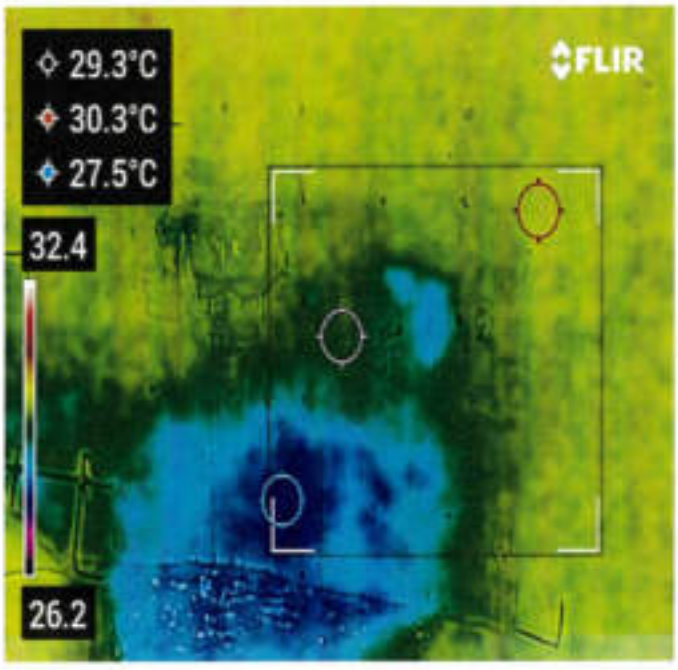

**Grid - b/w Ac-7d**

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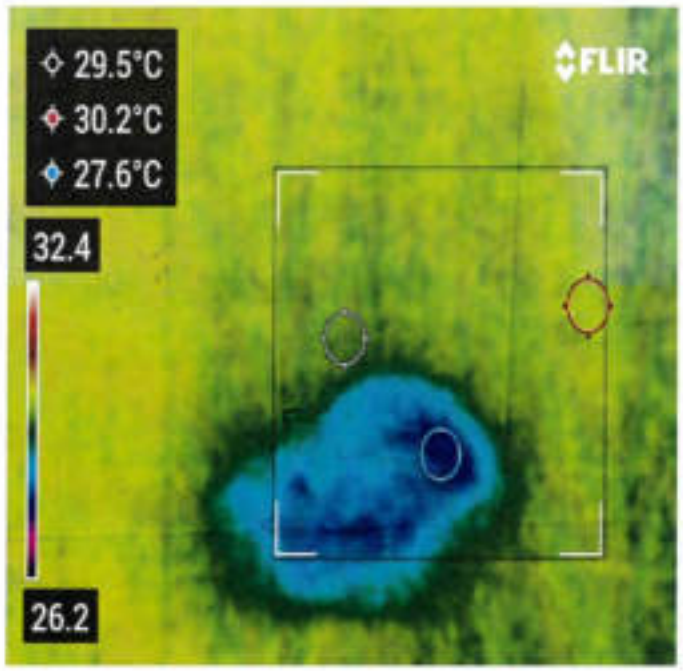
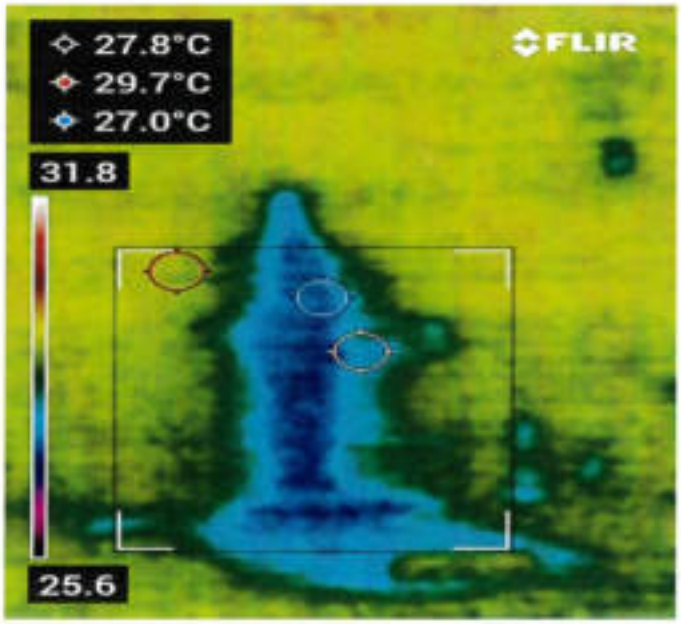


Grid - Td/7d-8d



Grid - Td/8d-9d

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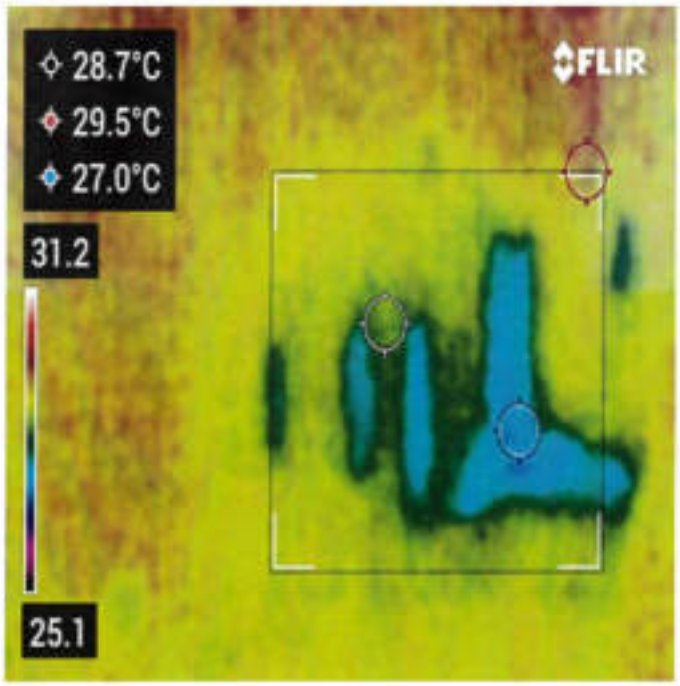
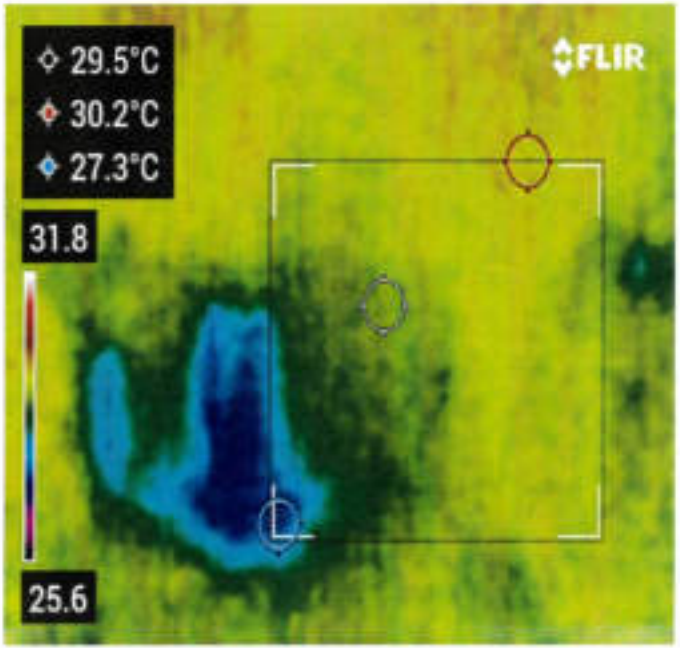


Grid - Td/9d-10d



Grid - Td/10d-11d

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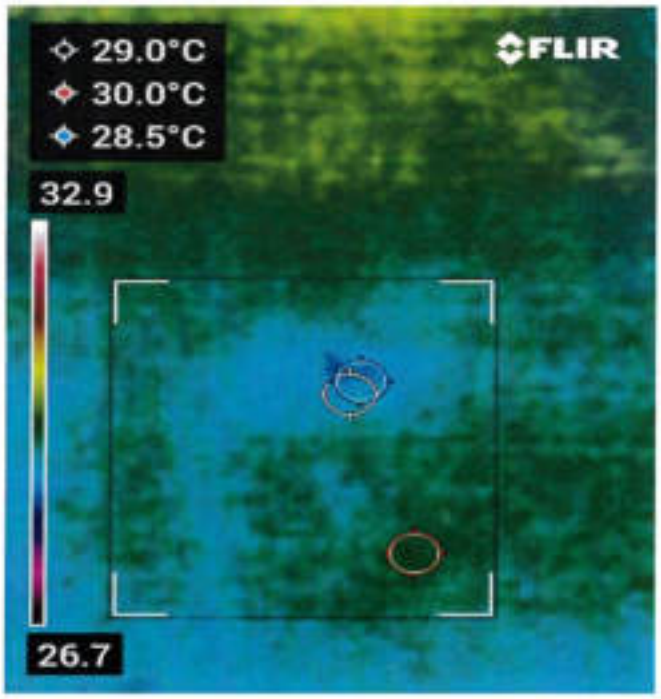

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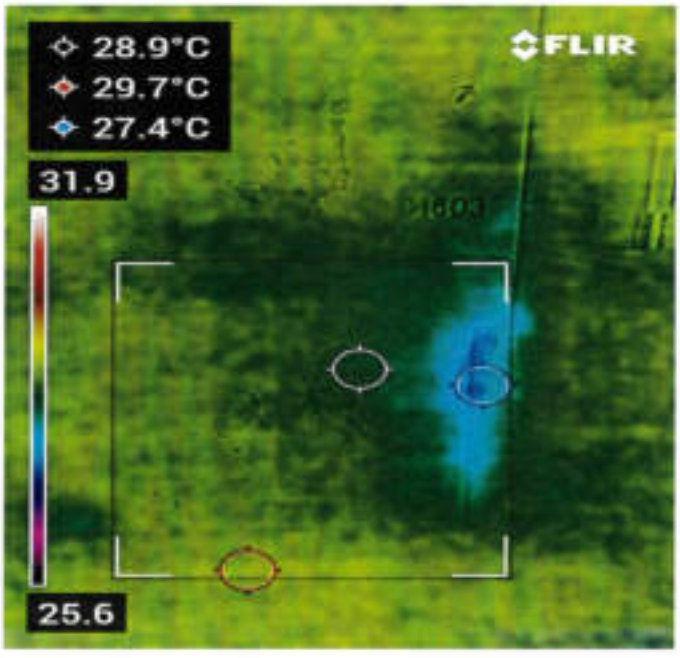

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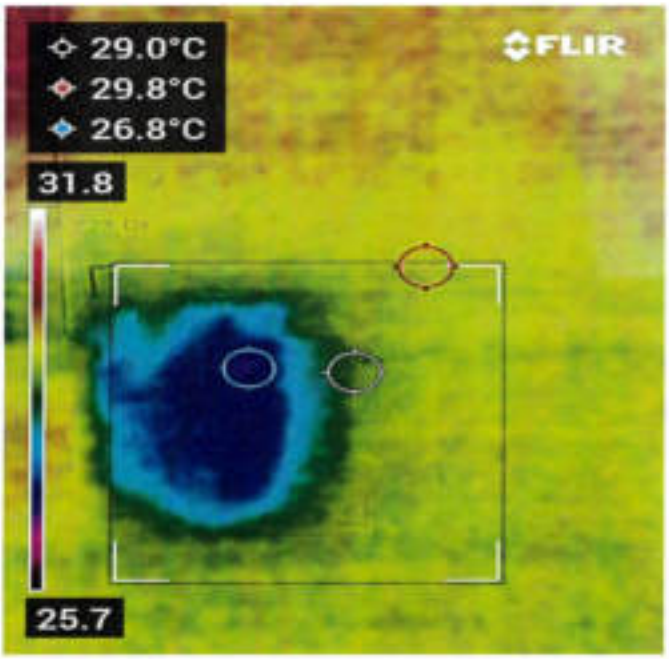
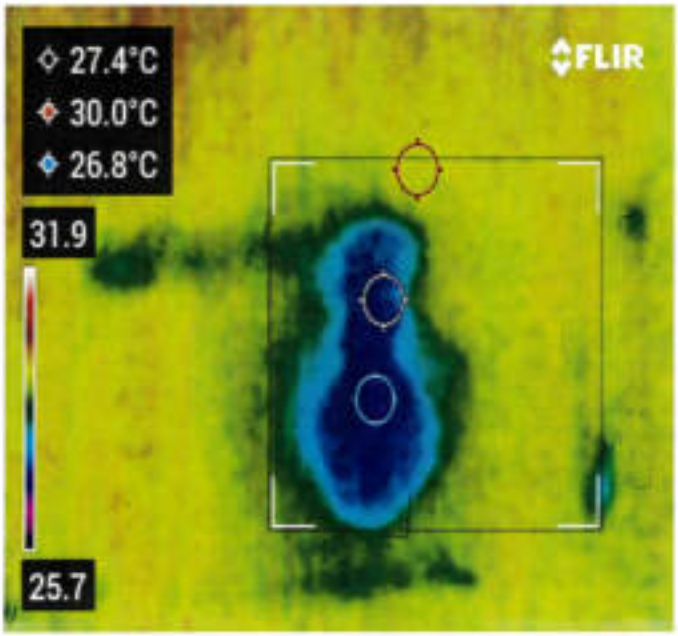


**Grid - Sd/11d-12d**



**Grid - Sd/12d-13d**

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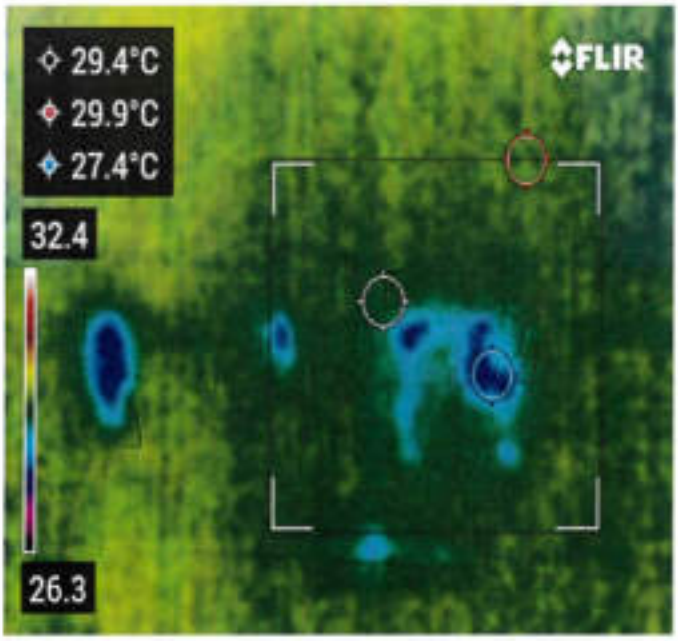
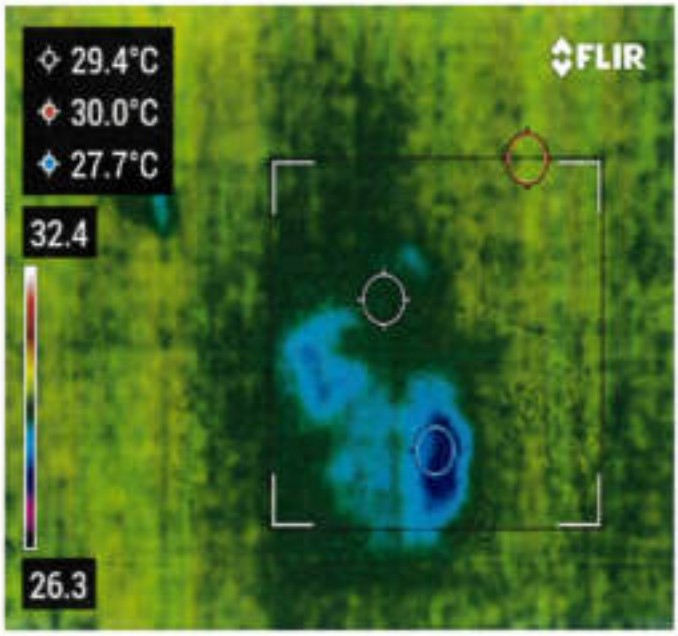


Grid - Sd/13d



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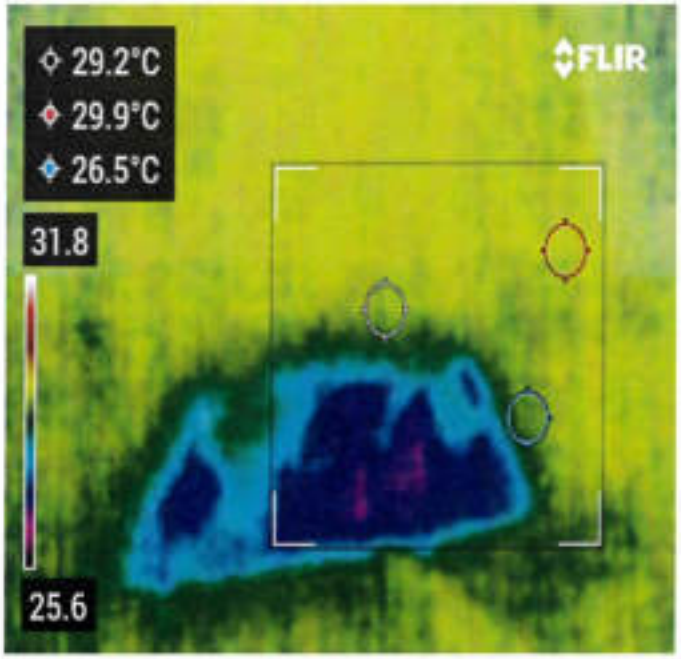

**Grid - Sd/Ab-14d**

**Bureau Veritas (India) Private Limited**
***Construction Services Laboratory***
43, 45-47, Pete Chennappa Inds. Estate
1st Main, Magadi Road, Kamakshipalya
Bangalore - 560 079. INDIA
Tel.: +91 80 23011800
Email: bangalore.lab@bureauveritas.com

**TEST REPORT**

TC-6006

Report No.:BVIPL:WATER: KL/1371/2/2023
Test order dated: 13.02.2023

Date: 16.02.2023
Page: 1 of 1

**Army Welfare Housing Organisation**
C/o Prasanna Vihar, Marine Drive
Opp. High Court, Kochi – 682 031.

ULR-TC 6006 23 1000025 23F
CHEMICAL TESTING
Water

## TEST REPORT ON ANALYSIS OF WATER SAMPLE

| | | |
|---|---|---|
| Source of Sample | : | Sample supplied by the customer |
| Customer's Reference | : | Letter No B/03029/SSI/Job Work/CHN/AWHO dated 30.12.2022 |
| Condition of samples | : | Satisfactory |
| UIN No. | : | 23006452 |
| Project # | : | Carrying Out of Structural Assessment and Consultancy for Analysis, NDT, retrofitting Scheme at AWHO Project SSI, Kochi. |
| Sample Description # | : | Ground Water Sample |
| Sample Id # | : | Tower B (Below Basement Flooring) |
| Period of test | : | 15.02.2023 to 16.02.2023 |
| Test Method | : | IS:456 - 2000(Reaffirmed 2021), IS:3025:(Part 11,17,18): 2022, IS:3025:(Part 22,23):1986 (Reaffirmed 2019), IS:3025:(Part 24:Sec 1):2022 IS:3025:(Part 32):1988(Reaffirmed 2019) |

| Sl No | Particulars | Results | Stipulations of IS:456-2000 (water for construction purpose) |
|---|---|---|---|
| 1 | Quantity of 0.02N NaOH required to neutralise 100ml of water sample using phenolphthalein as an indicator | 0.10 ml | Shall not be more than 5 ml |
| 2 | Quantity of 0.02N $H_2SO_4$ required to neutralise 100ml of water sample using mixed indicator | 61.30 ml | Shall not be more than 25ml |
| 3 | Chlorides as Cl | 241.10 mg/l | 500 mg/l max. for RCC<br>2000 mg/l max. for PCC |
| 4 | Sulphates as $SO_3$ | 58.69 mg/l | 400 mg/l max. |
| 5 | Inorganic Solids | 853.00 mg/l | 3000 mg/l max. |
| 6 | Organic Solids | 247.00 mg/l | 200 mg/l max. |
| 7 | Suspended matter | 7.00 mg/l | 2000 mg/l max. |
| 8 | pH Value | 13.04 | Shall not be less than 6 |

# As furnished by the customer

**Remarks: The tested water sample does not conforms to the requirements of IS:456-2000 for plain and reinforced concrete construction.**

Note:
1. The results relate only to the items tested.
2. Report shall not be reproduced, except in full, without the written approval of the lab.
3. Any correction invalidates this report.

**for BUREAU VERITAS (INDIA) PRIVATE LIMITED**
**Construction Services Laboratory**

16/2/2023

**KRISHNA. V**
Senior Chemist

****END OF THE REPORT****

723260

*Indicates information provided by the customer for which the laboratory has no control. Sampling not done by laboratory, results relate to the sample tested only.
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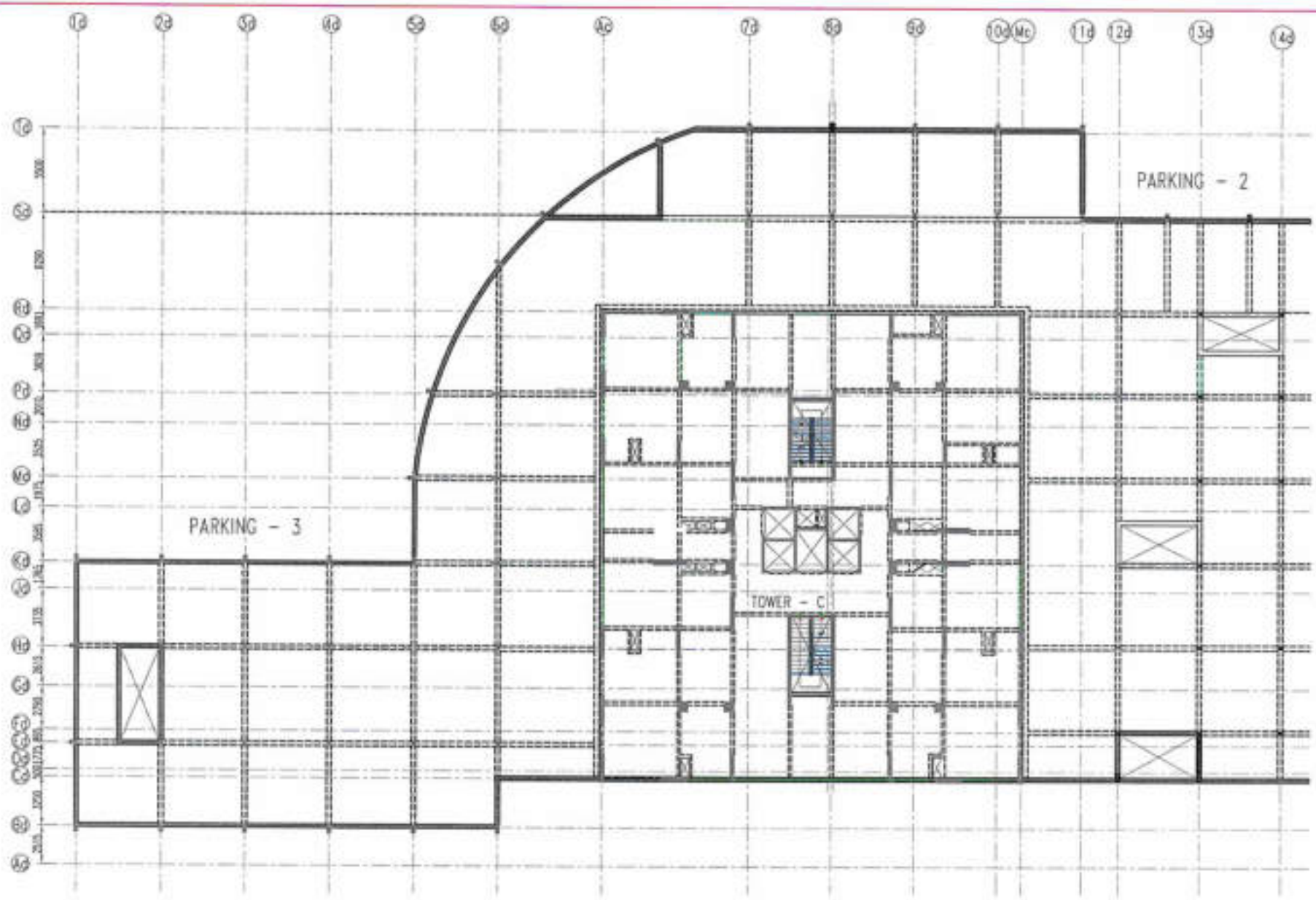
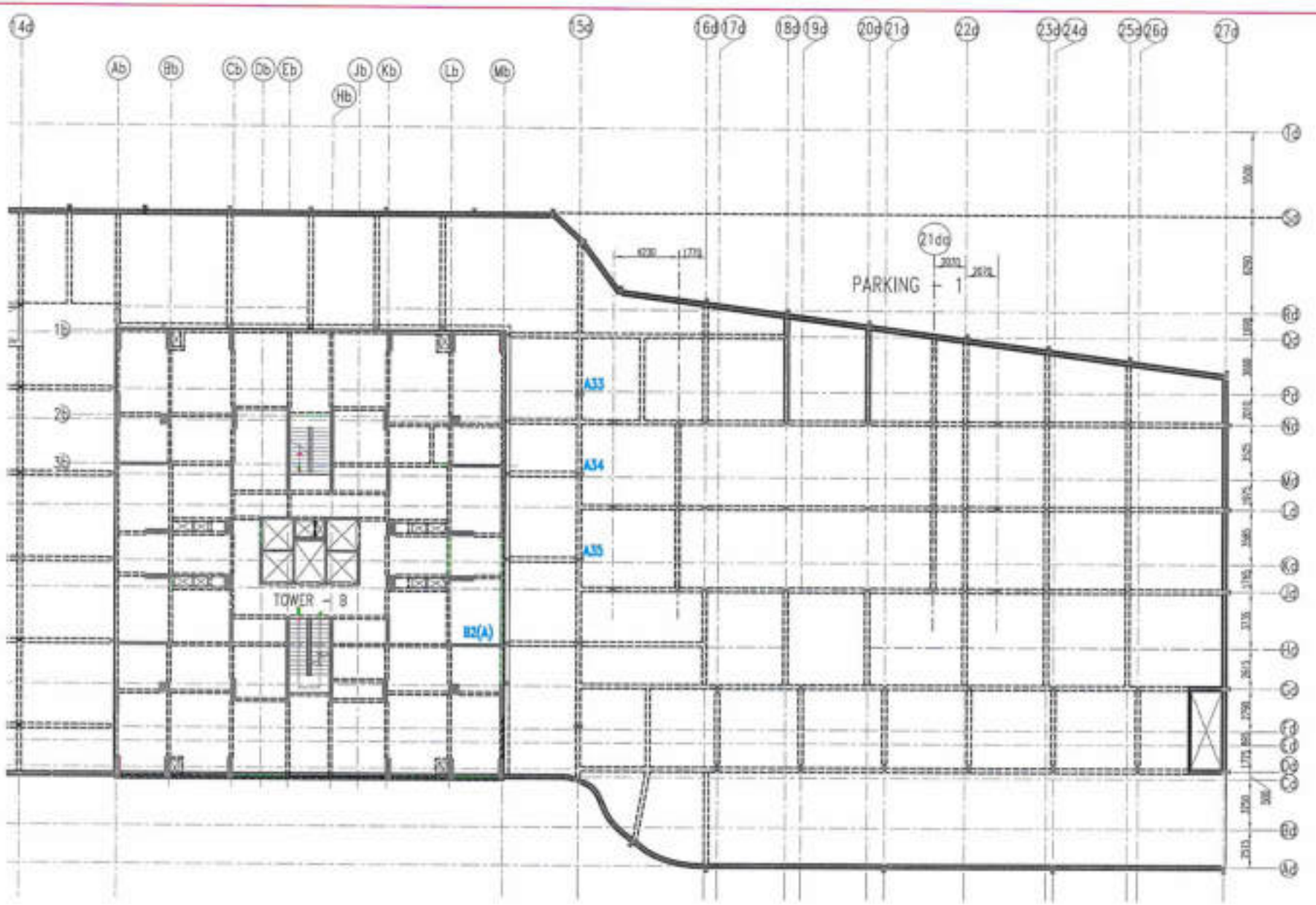
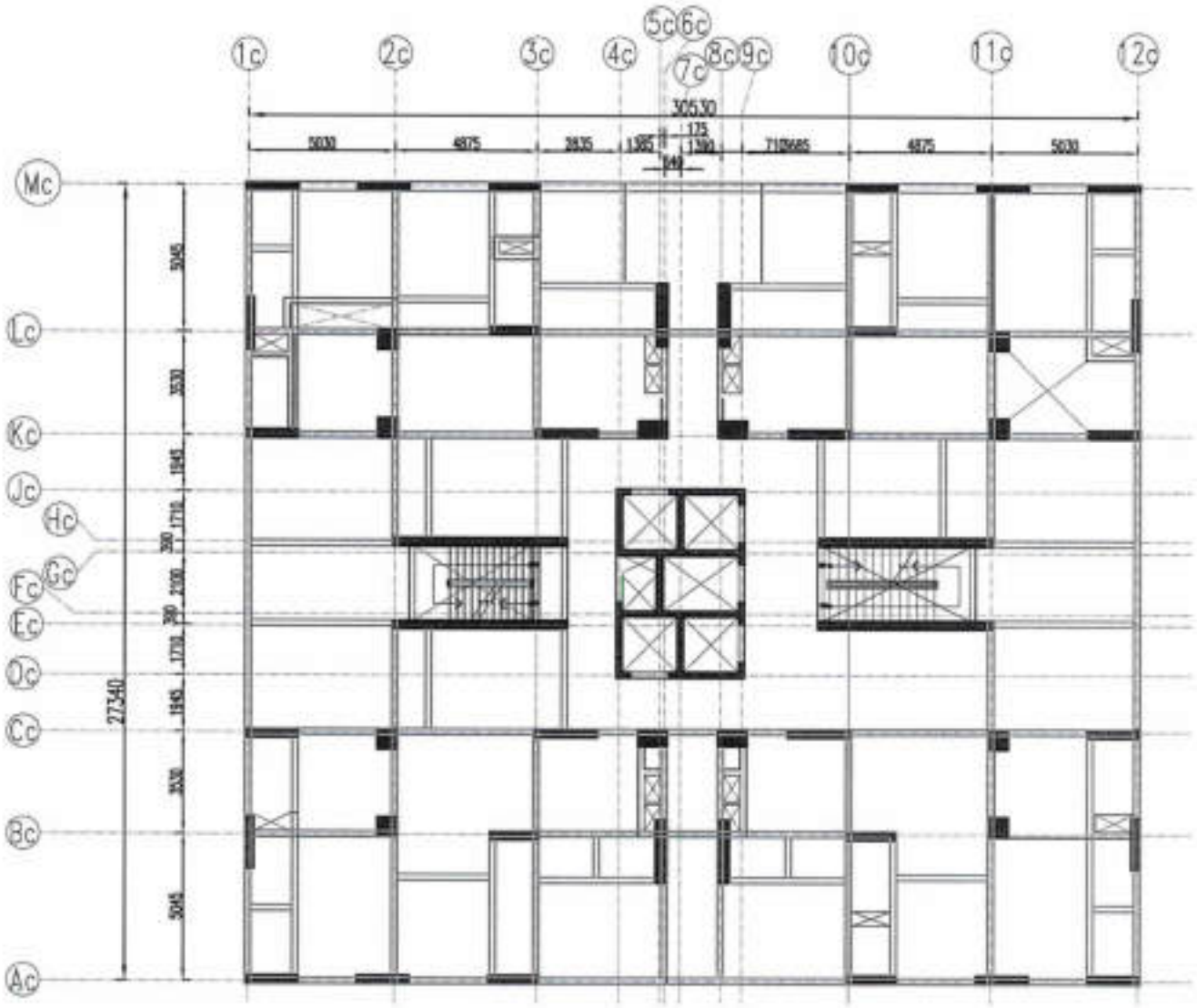
# LAYOUT SKETCHES




| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF BASEMENT FLOOR TOWER - C** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/BF-01 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |

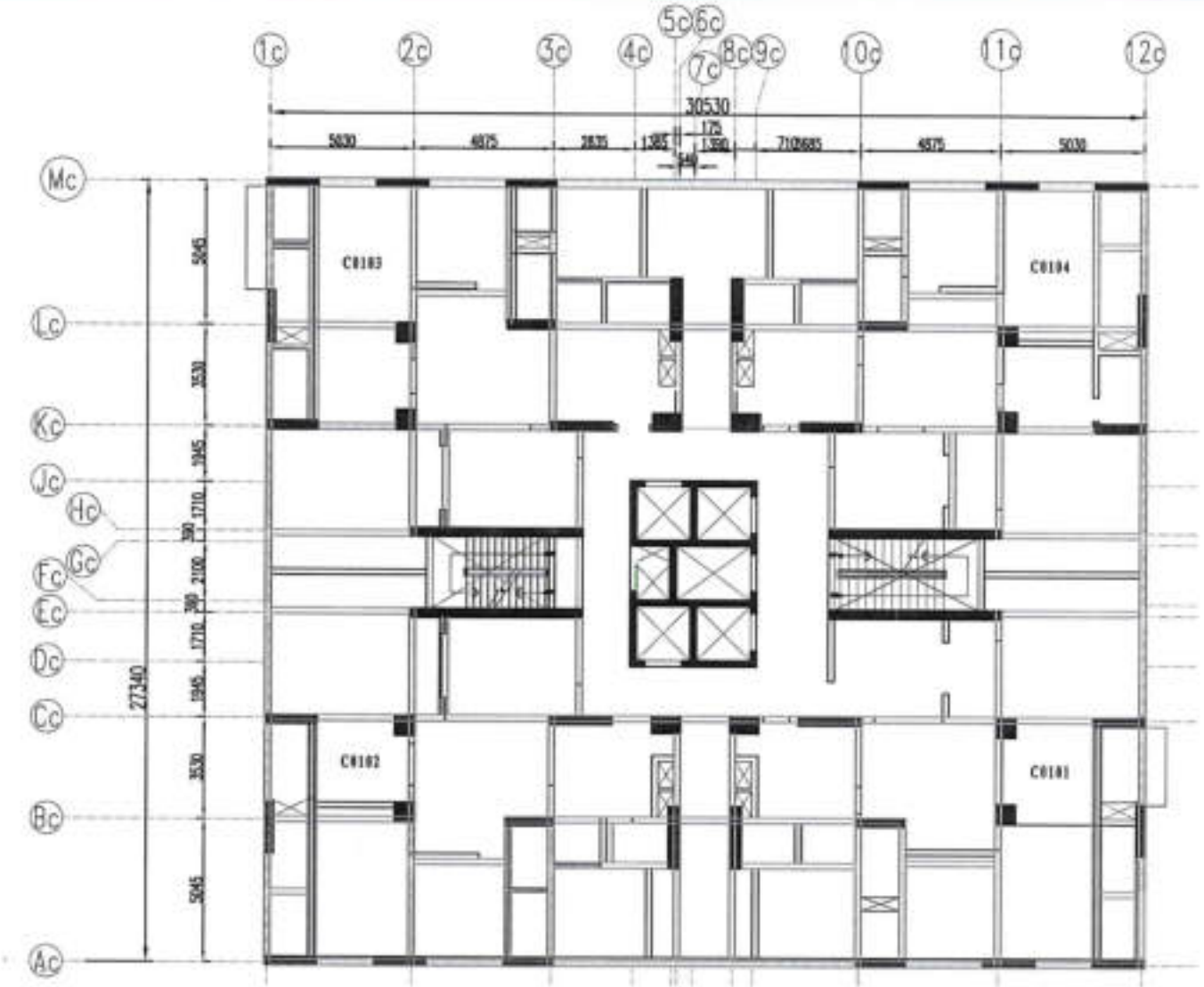



| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF BASEMENT FLOOR TOWER - B** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/BF-01 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



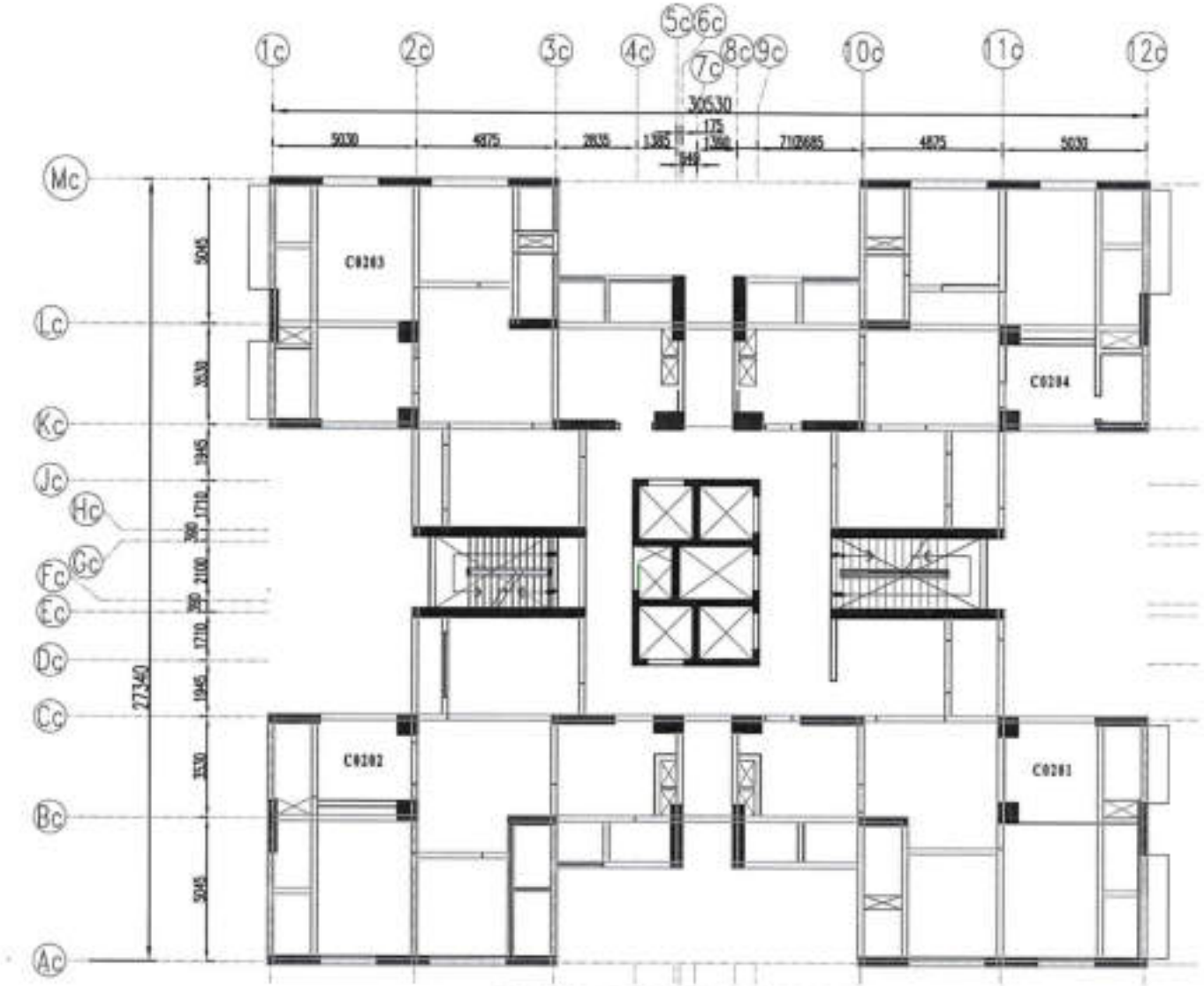

TOWER-C-GROUND FLOOR PLAN

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C - GROUND FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No.: GL/GF/TC-02 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. # 139, 13th Cross, Seshadripuram 2nd Stage, Bangalore - 560 020. Tel.: 080-23466200 | | CONTRACT NO: 17671143 | |



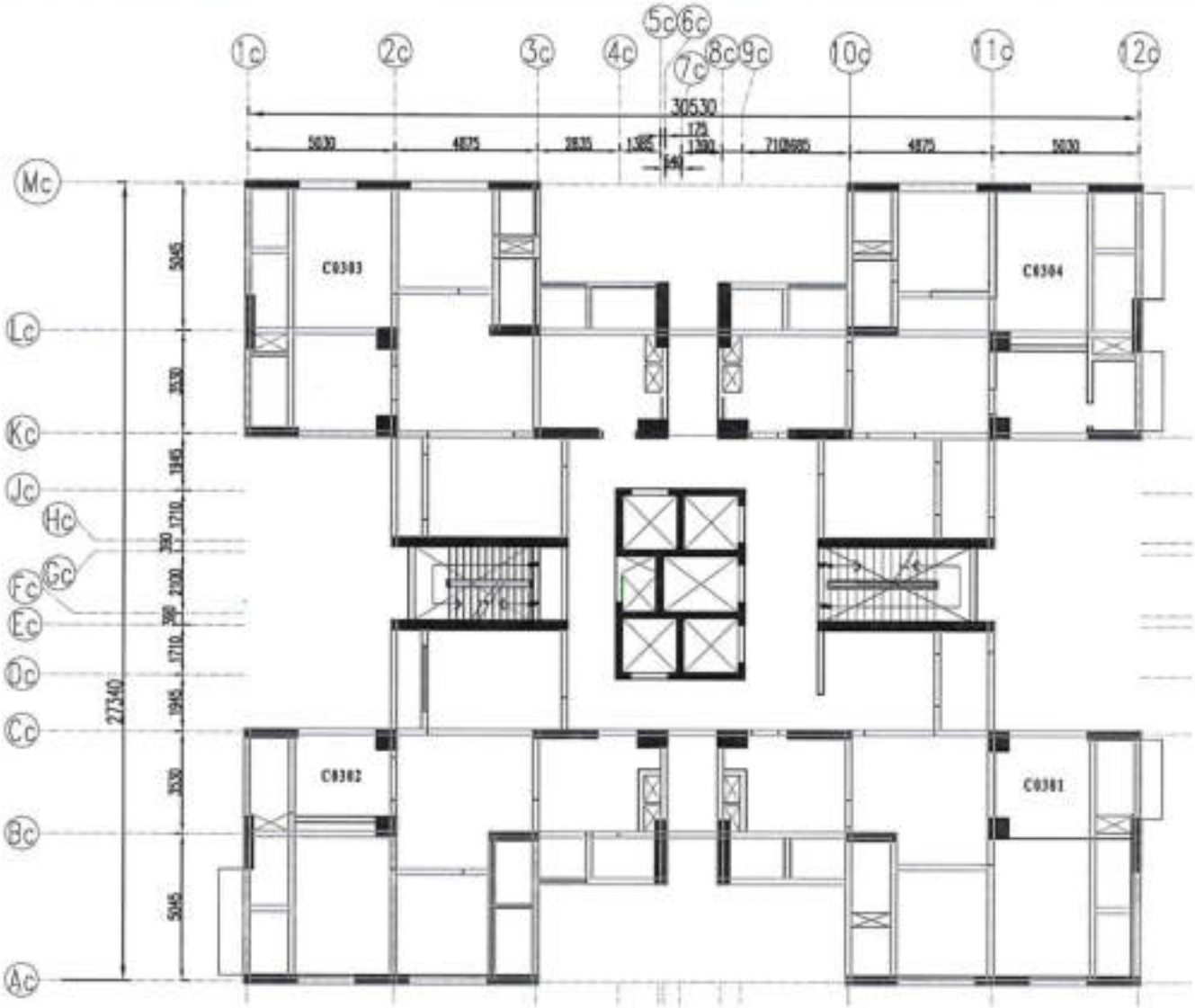

TOWER-C-FIRST FLOOR PLAN

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C - FIRST FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/1F/TC-03 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




TOWER-C-SECOND FLOOR PLAN

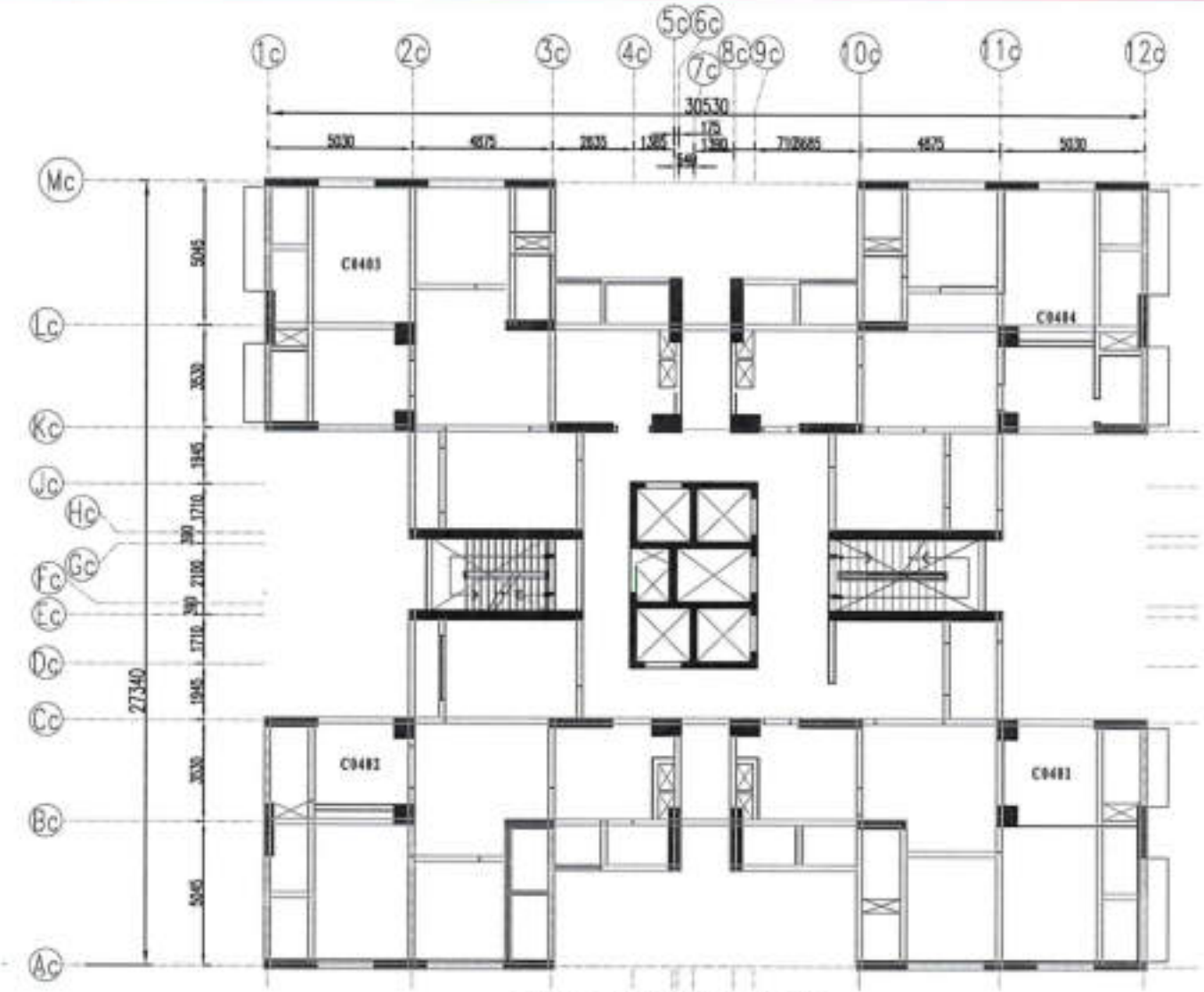
| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: GENERAL LAYOUT OF TOWER C - SECOND FLOOR | DRAWN: RS/KK | CHECKED: CHR/MBS | SCALE: NTS / DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/2F/TC-04 / REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 |




TOWER-C-THIRD FLOOR

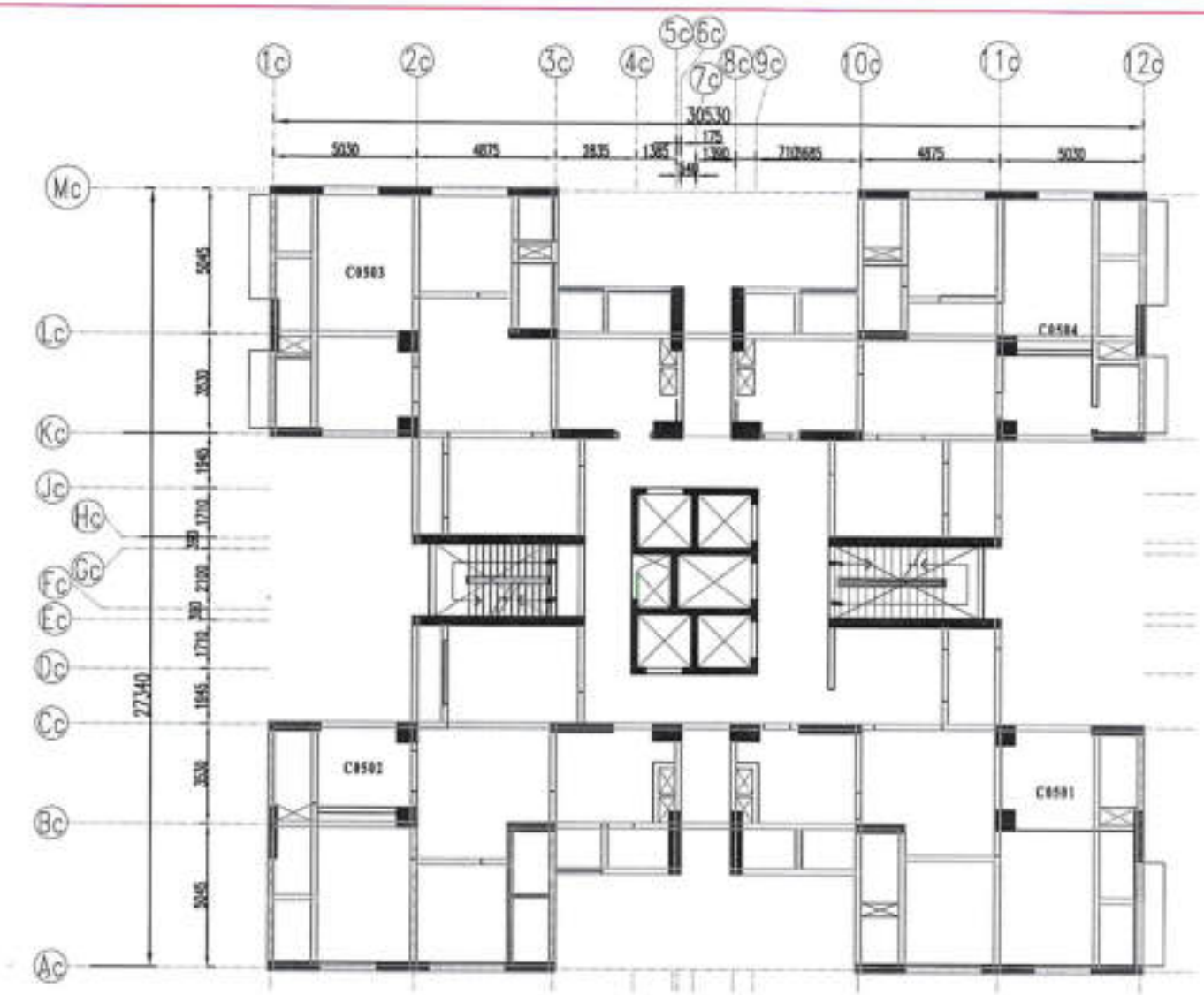
| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C - THIRD FLOOR** | DRAWN: RS/KK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | |

| | |
|---|---|
| SCALE: NTS | DATE: 24-04-2023 |
| DWG. REF. No : GL/3F/TC-05 | REV.No. R0 |
| CONTRACT NO: 17671143 | |



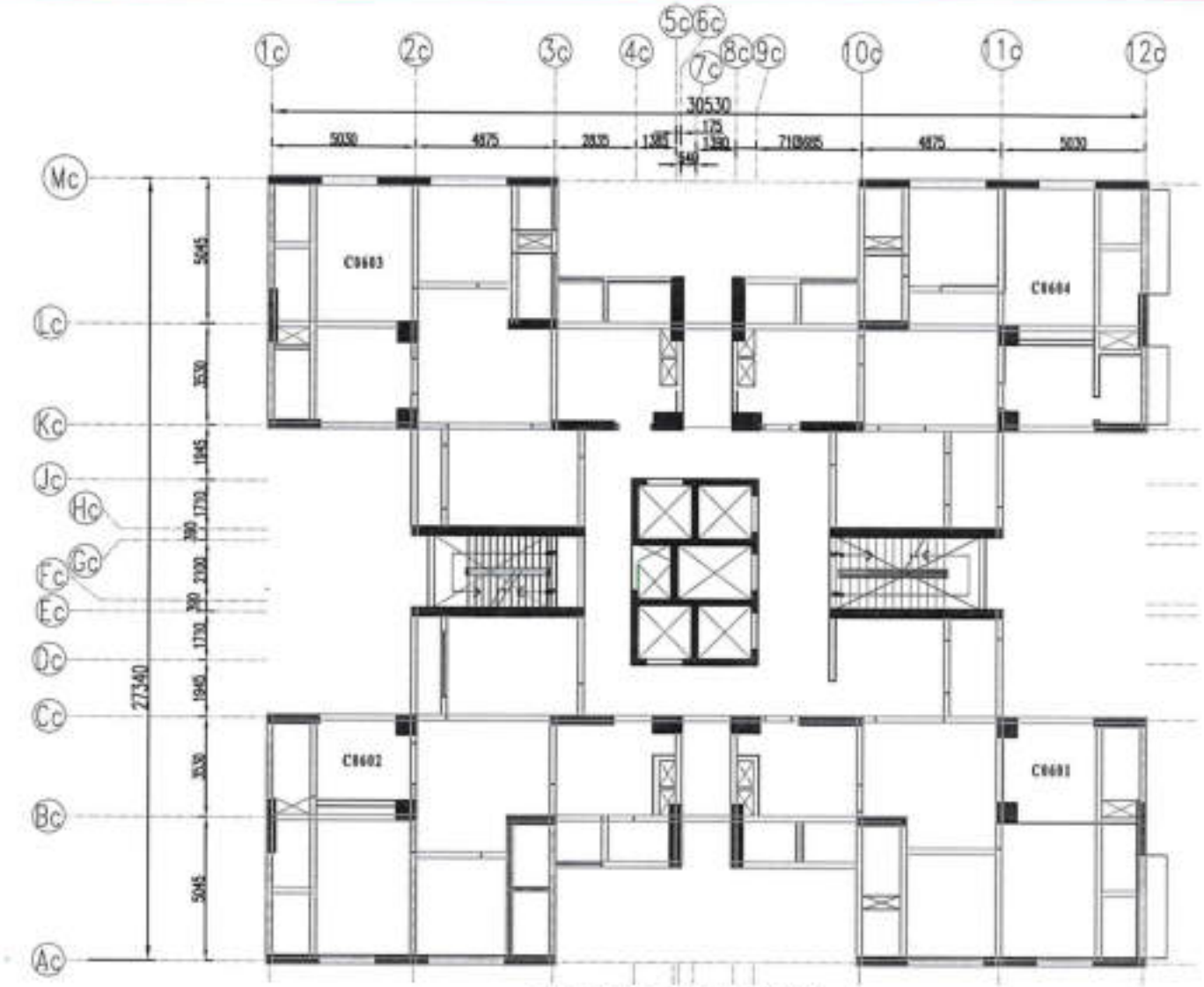

TOWER-C-FOURTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: GENERAL LAYOUT OF TOWER C -4TH FLOOR | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/4F/TC-06 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERNUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



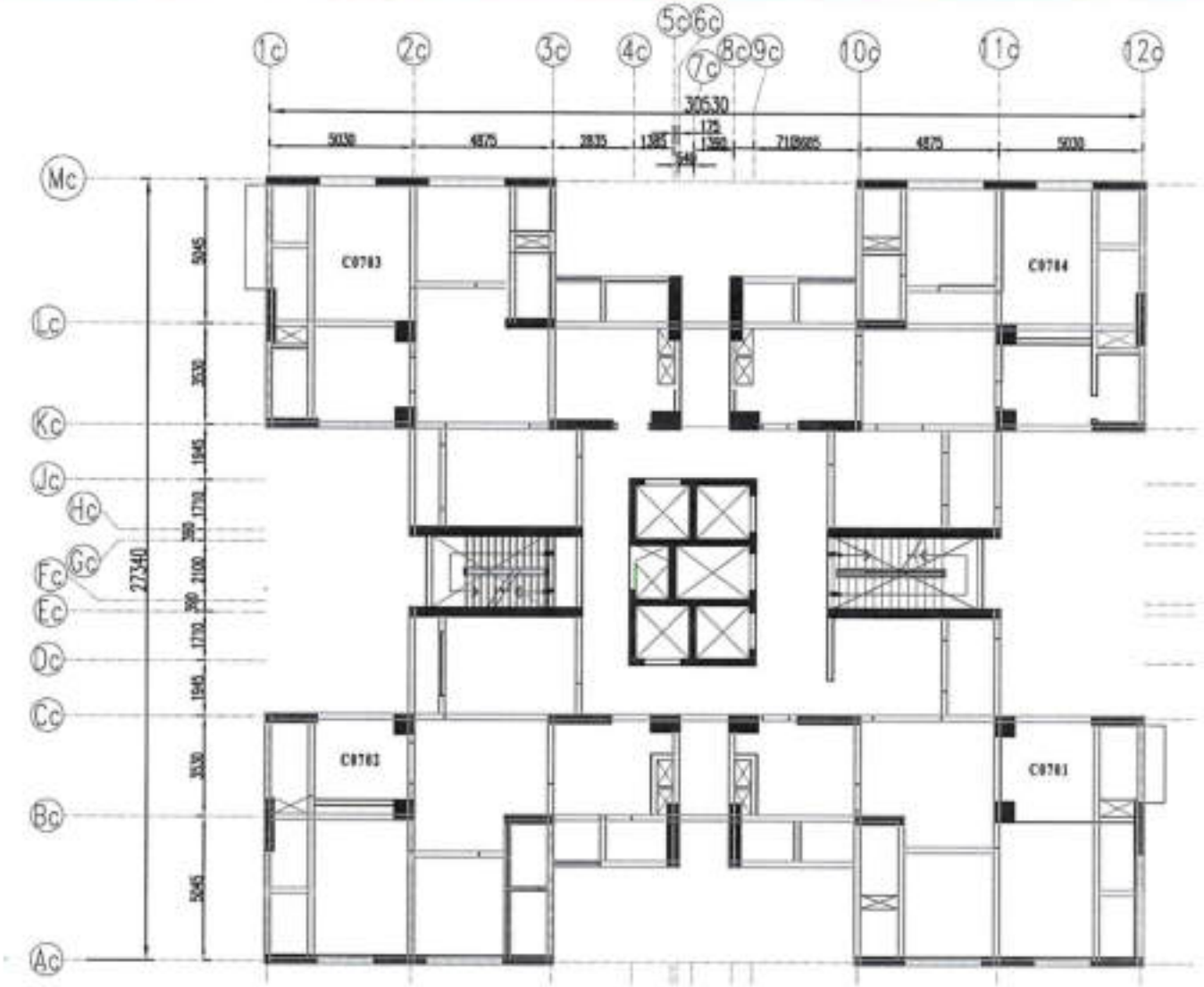

TOWER-C-FIFTH FLOOR

| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -5TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS / DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/5F/TC-07 / REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDIGARHI ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 |



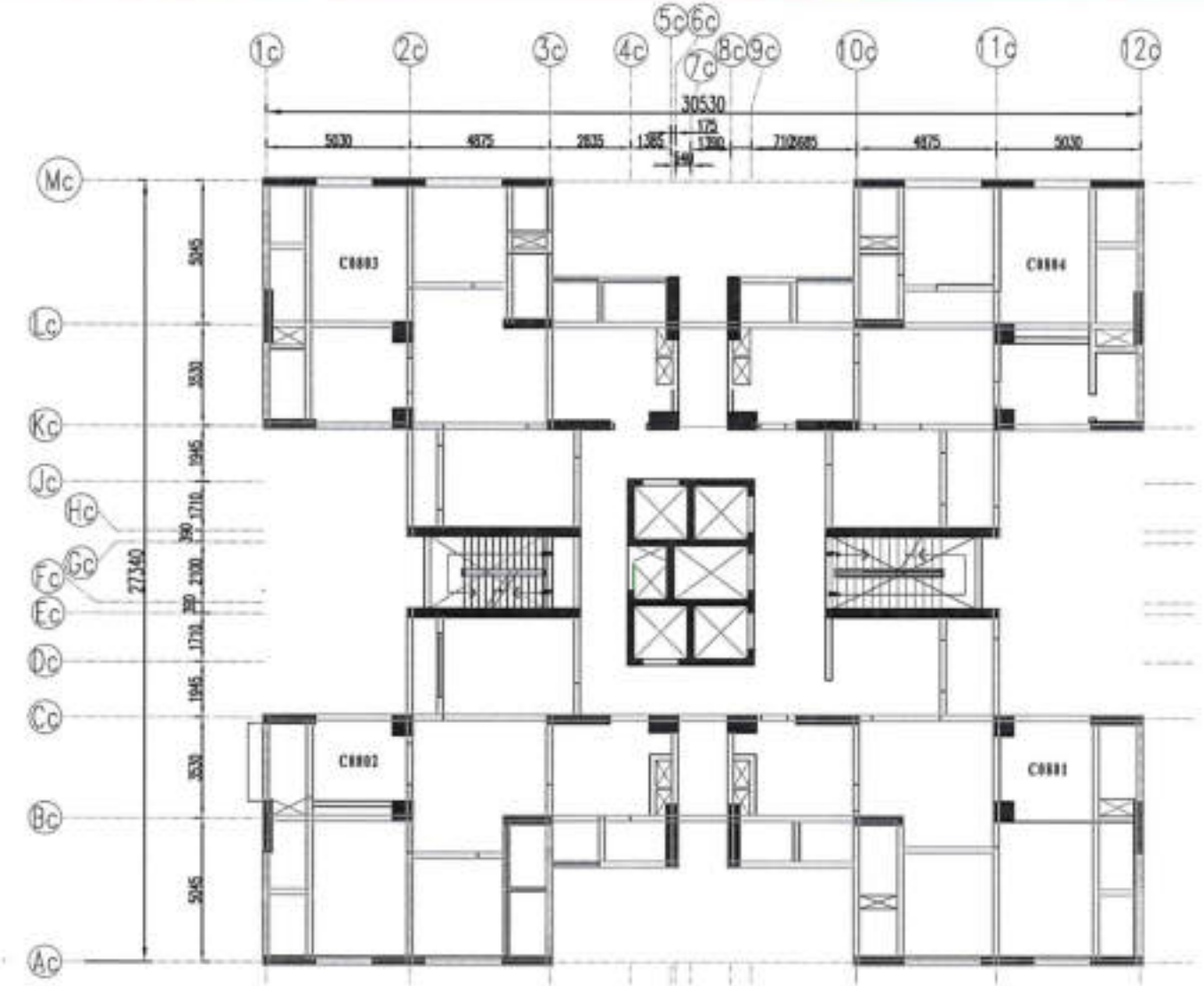

TOWER-C-SIXTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -6TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/6F/TC-08 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDIGARH/AJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



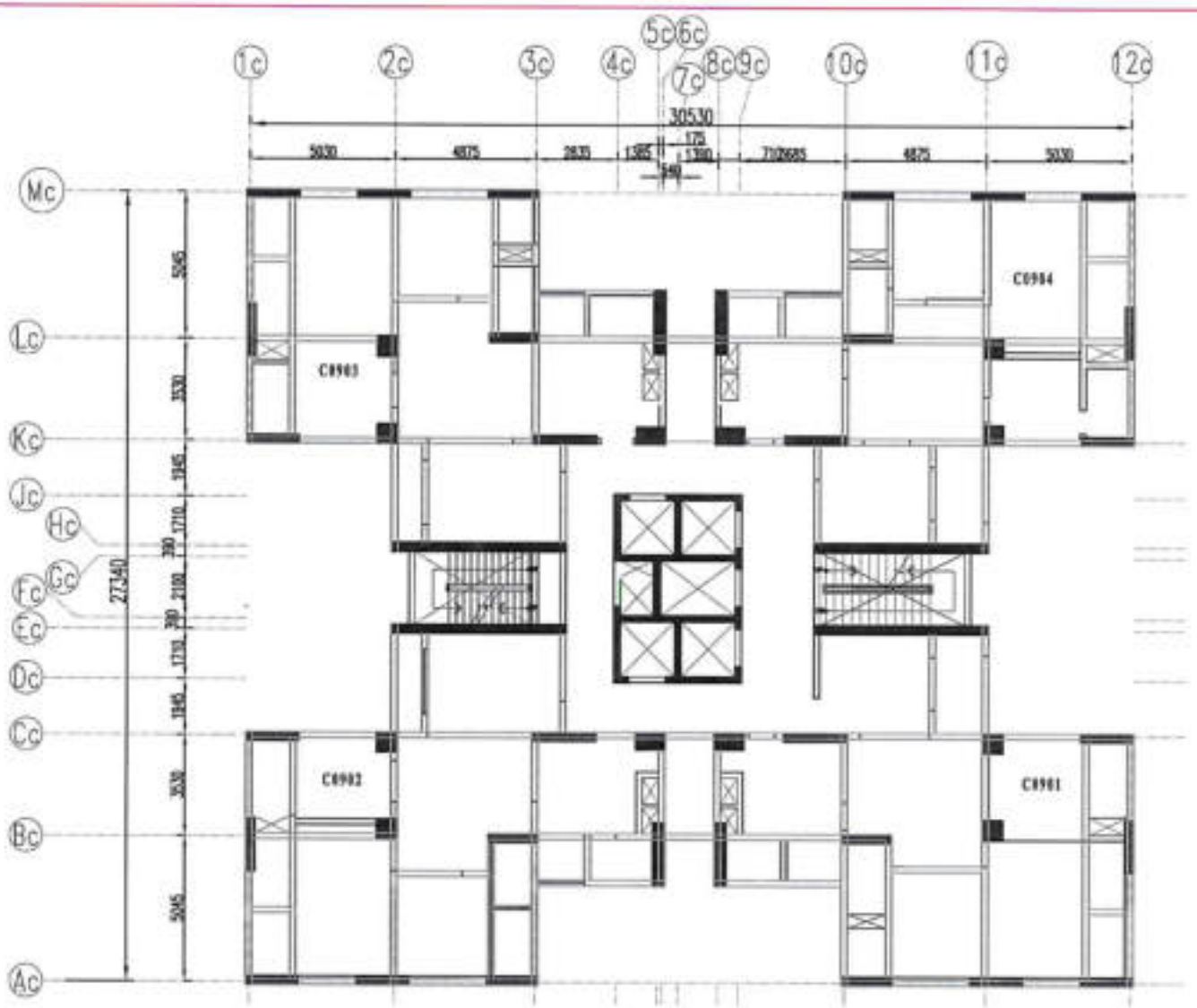

TOWER-C-SEVENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -7TH FLOOR** | DRAWN: RS/KK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 26-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/7F/TC-09 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



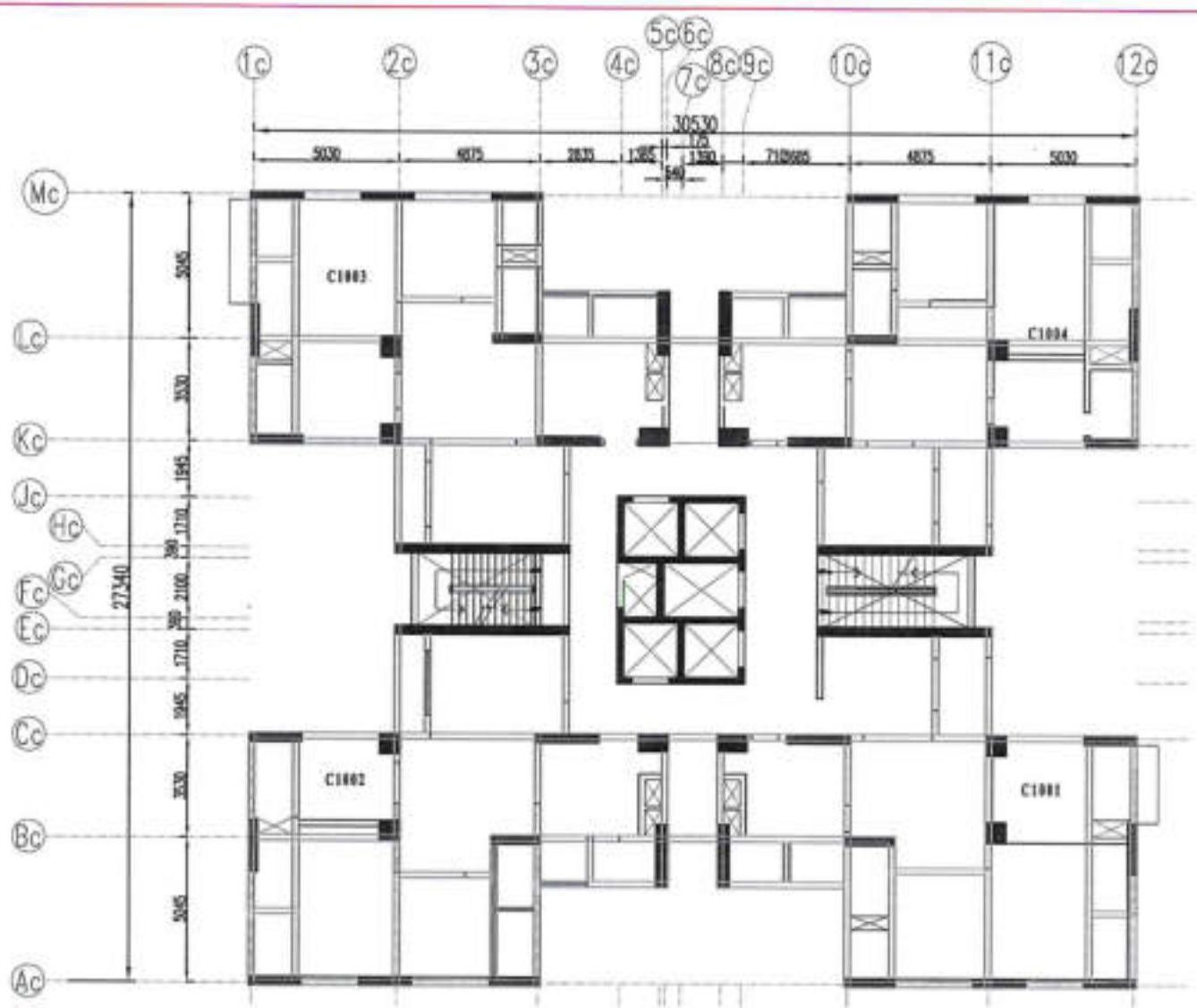

TOWER-C-EIGHTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: GENERAL LAYOUT OF TOWER C -8TH FLOOR | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 29-04-2022 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/8F/TC-10 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



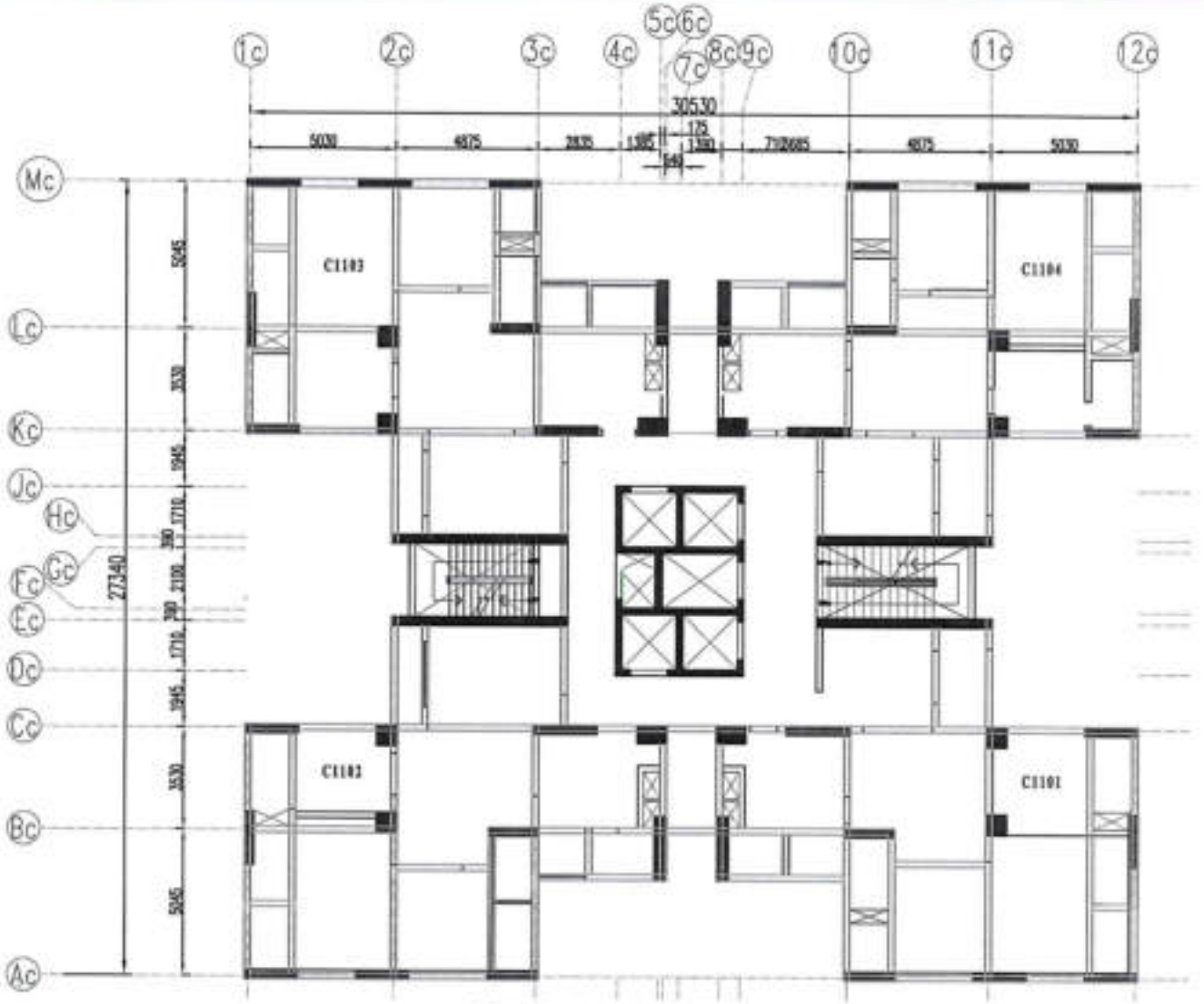

TOWER-C-NINETH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -9TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/9F/TC-11 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



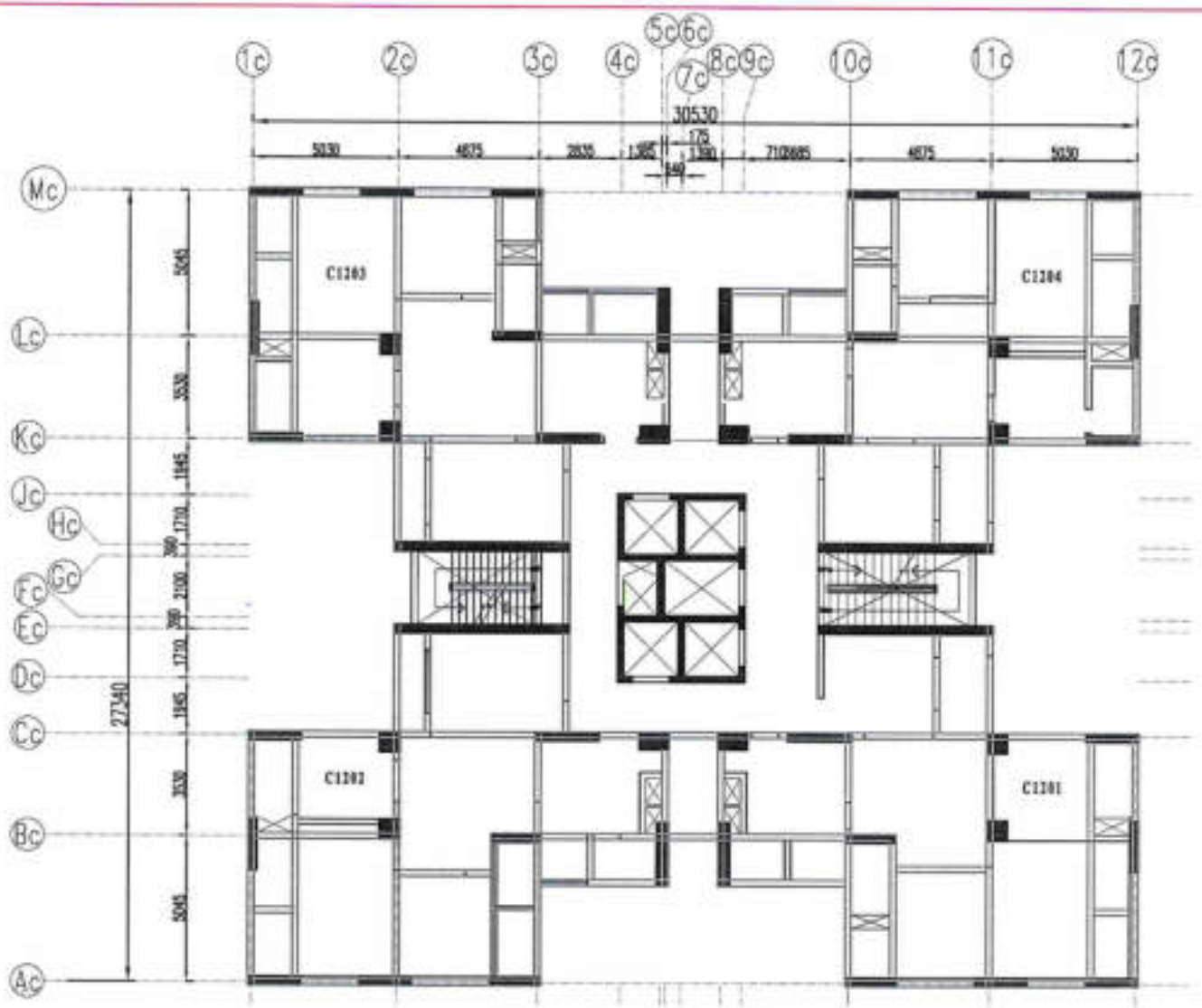

TOWER-C-TENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -10TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No :-GL/10F/TC-12 | REV.No: R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDEERUNG ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. # 109, 13th Cross, Dasarahalli 3rd Stage, Bangalore - 560 073. Tel. : 080-22882200 | | CONTRACT NO: 17671143 | |



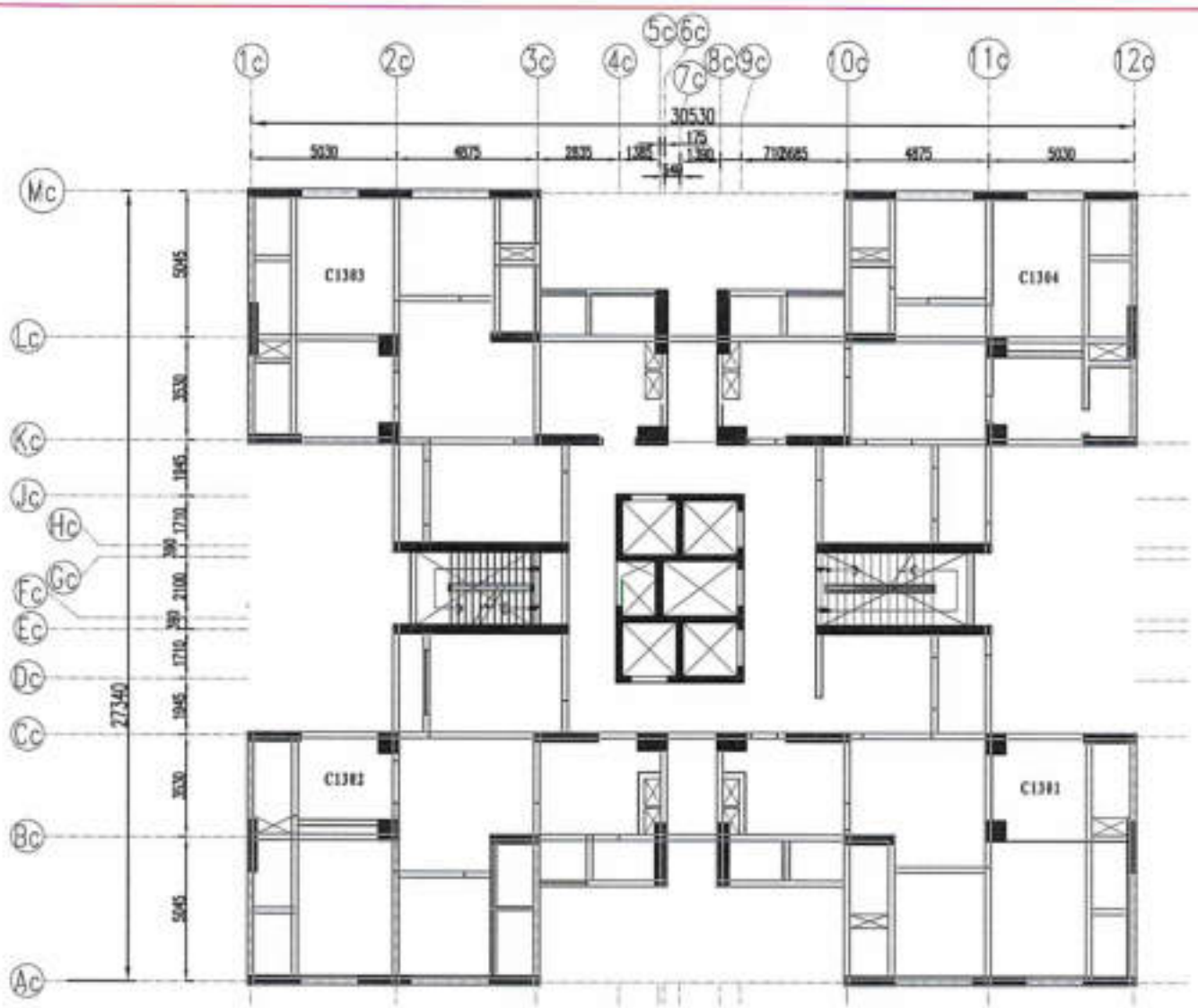

TOWER-C-ELEVENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -11TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 28-01-2023 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRAKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | | APPROVED: AJ/Dr.KS | DRG. REF. No: GL/11F/TC-13 | REV.No: R0 |
| | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 130, 13th Cross, Seshadripuram 2nd Stage, Bangalore - 560 020. Tel.: 080-23464000 | | CONTRACT NO: 17671143 | |



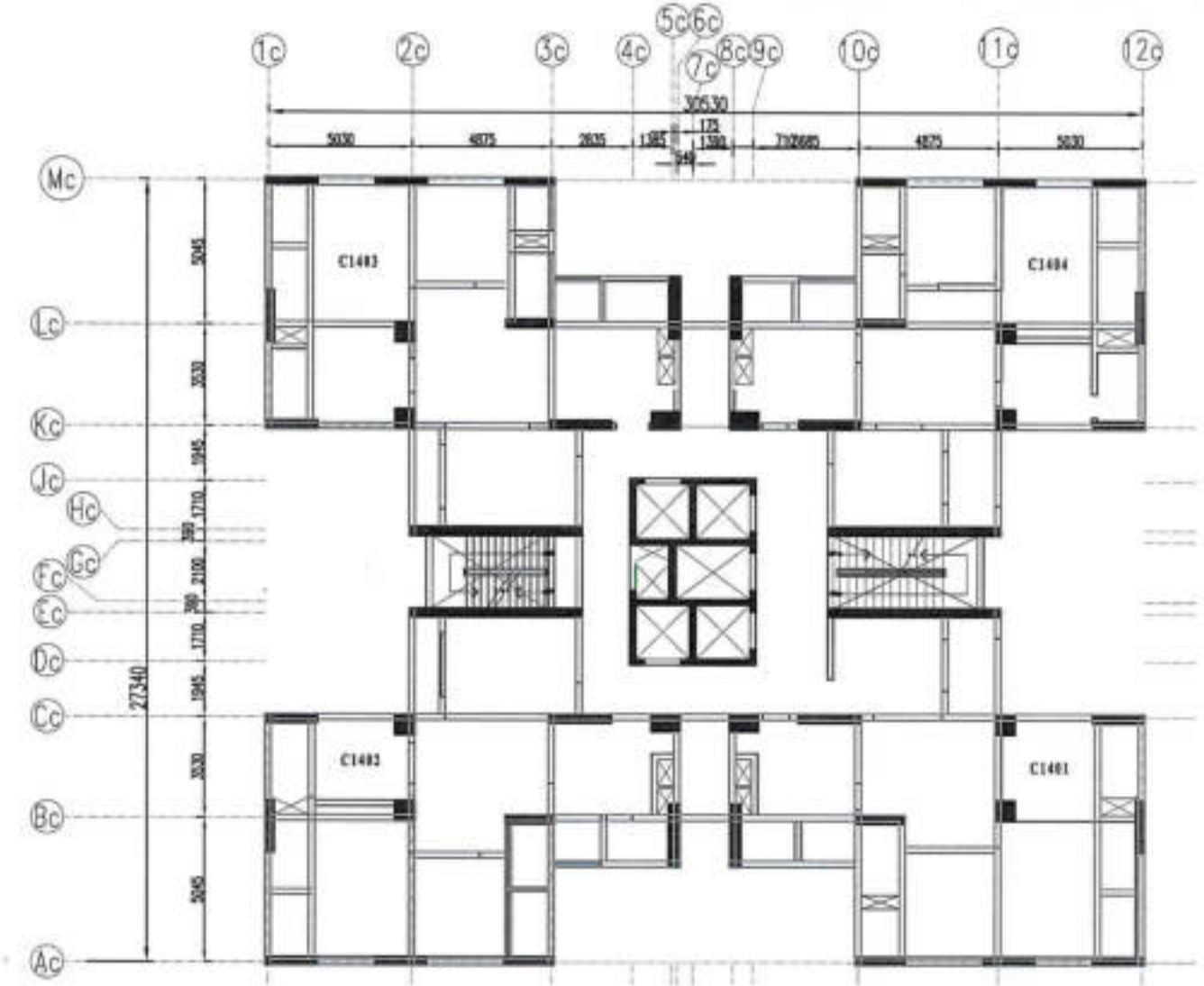

TOWER-C-TWELFTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -12TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/WBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/12F/TC-14 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



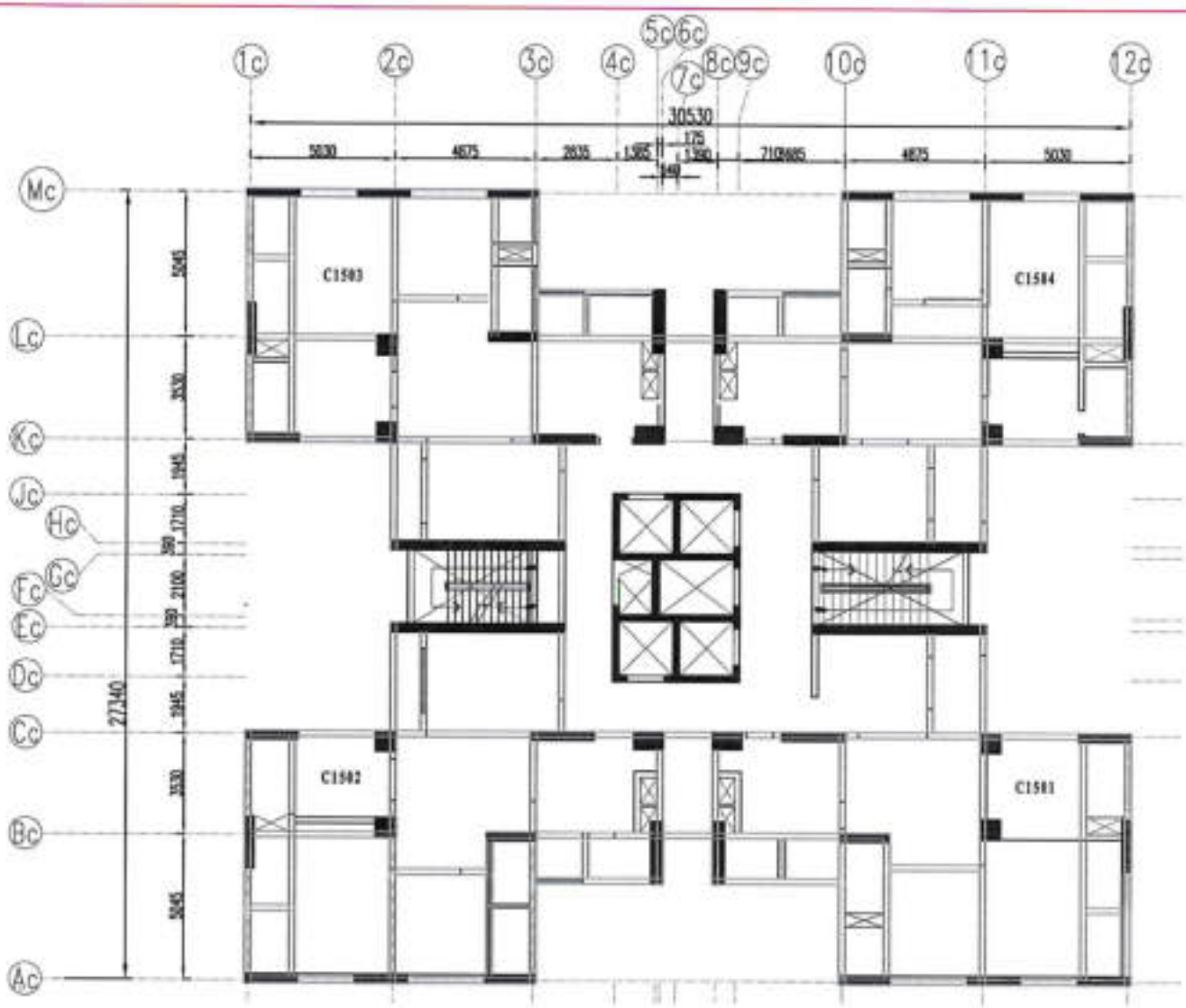

TOWER-C-THIRTEENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -13TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/13F/TC-15 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDIGARH ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



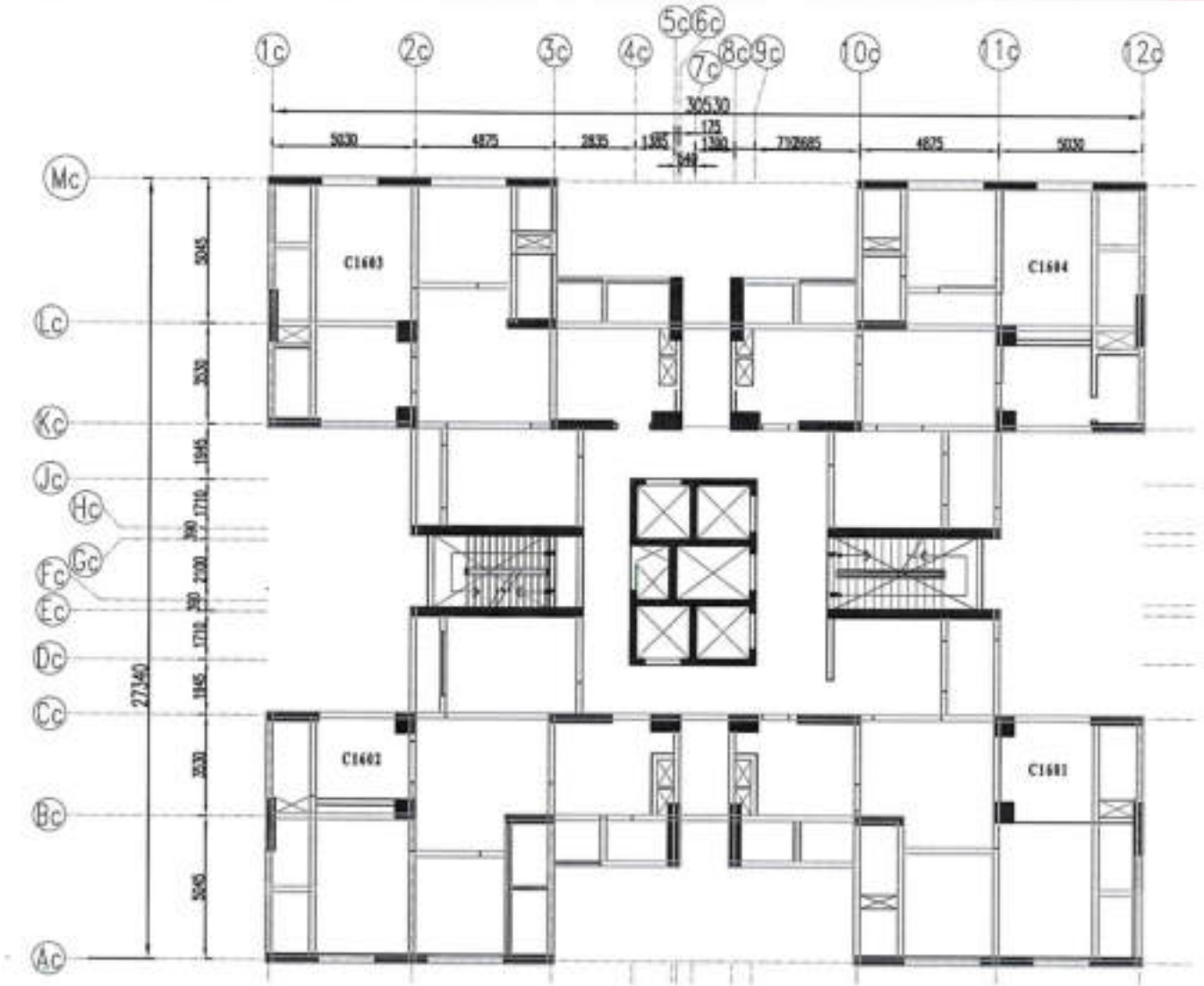

TOWER-C-FOURTEENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -14TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: QL/14F/TC-15 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



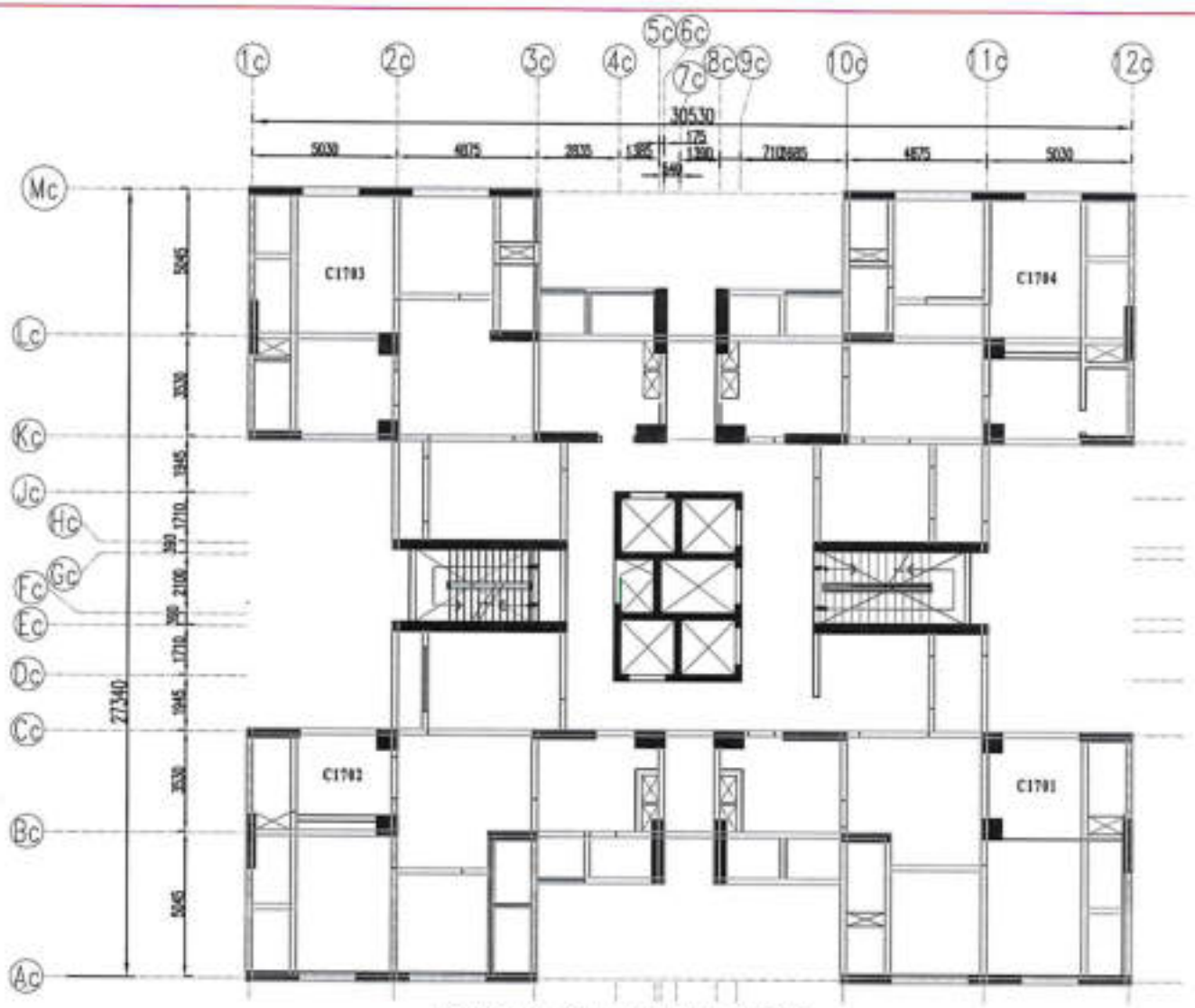

TOWER-C-FIFTEENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -15TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 29-04-2013 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/15F/TC-17 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRAKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



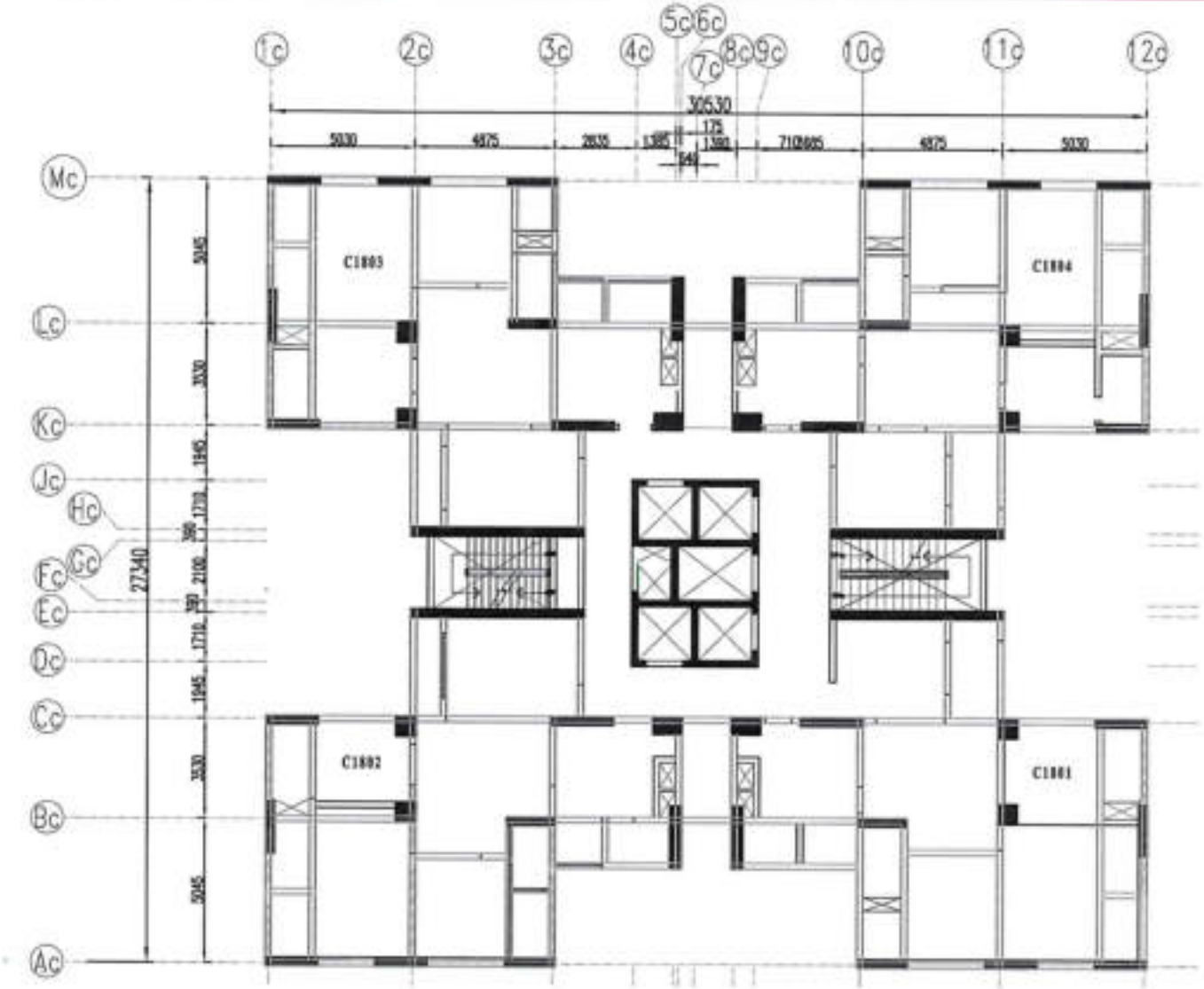

TOWER-C-SIXTEENTH FLOOR

| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -16TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS |
| | | | APPROVED: AJ/Dr.KS | DATE: 24-08-2023 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | DWG. REF. No :GL/16F/TC-18 REV.No. R0 |
| | | | | CONTRACT NO: 17671143 |



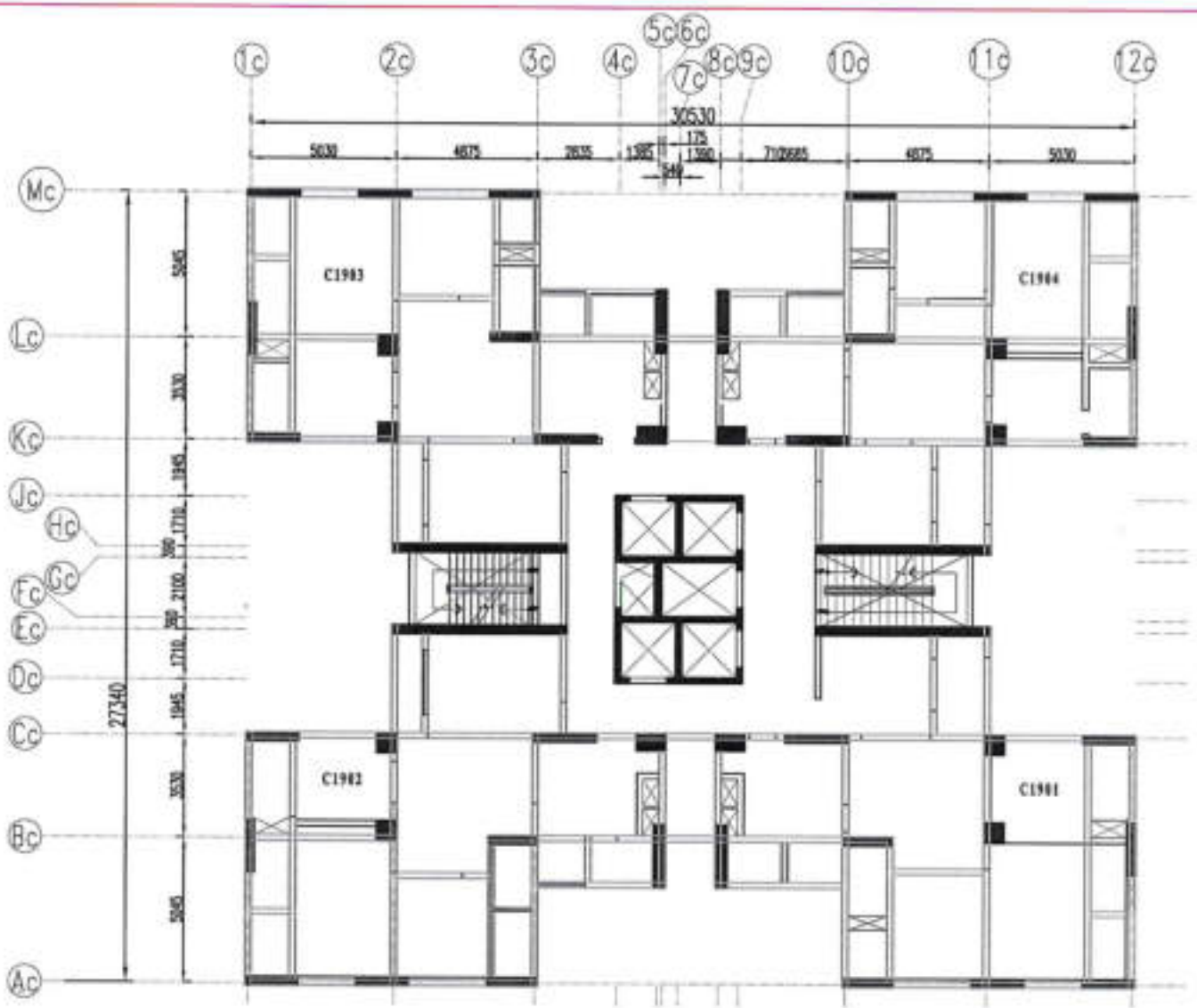

TOWER-C-SEVENTEENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -17TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : GL/17F/TC-19 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



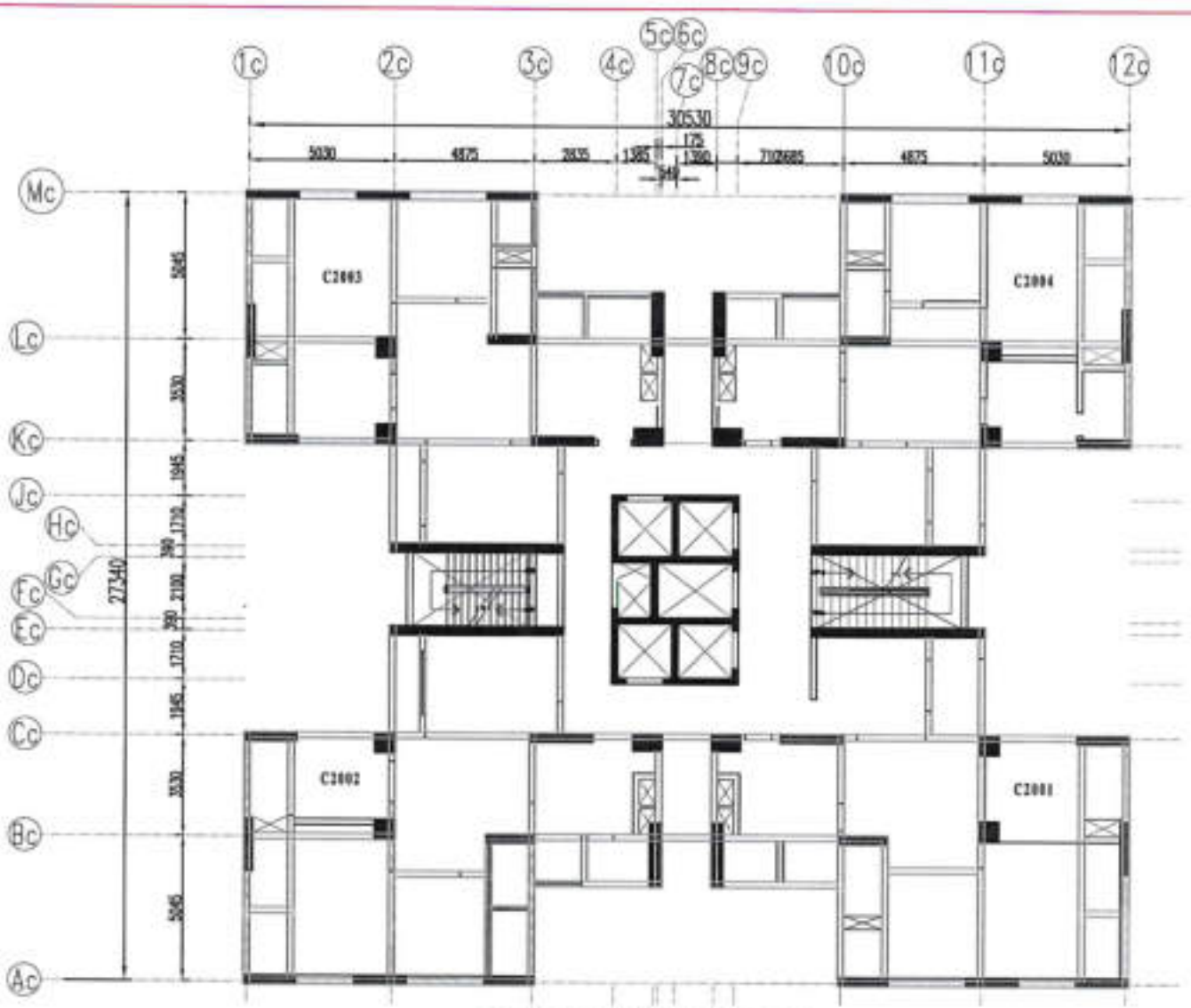

TOWER-C-EIGHTEENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: GENERAL LAYOUT OF TOWER C -18TH FLOOR | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/18F/TC-20 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



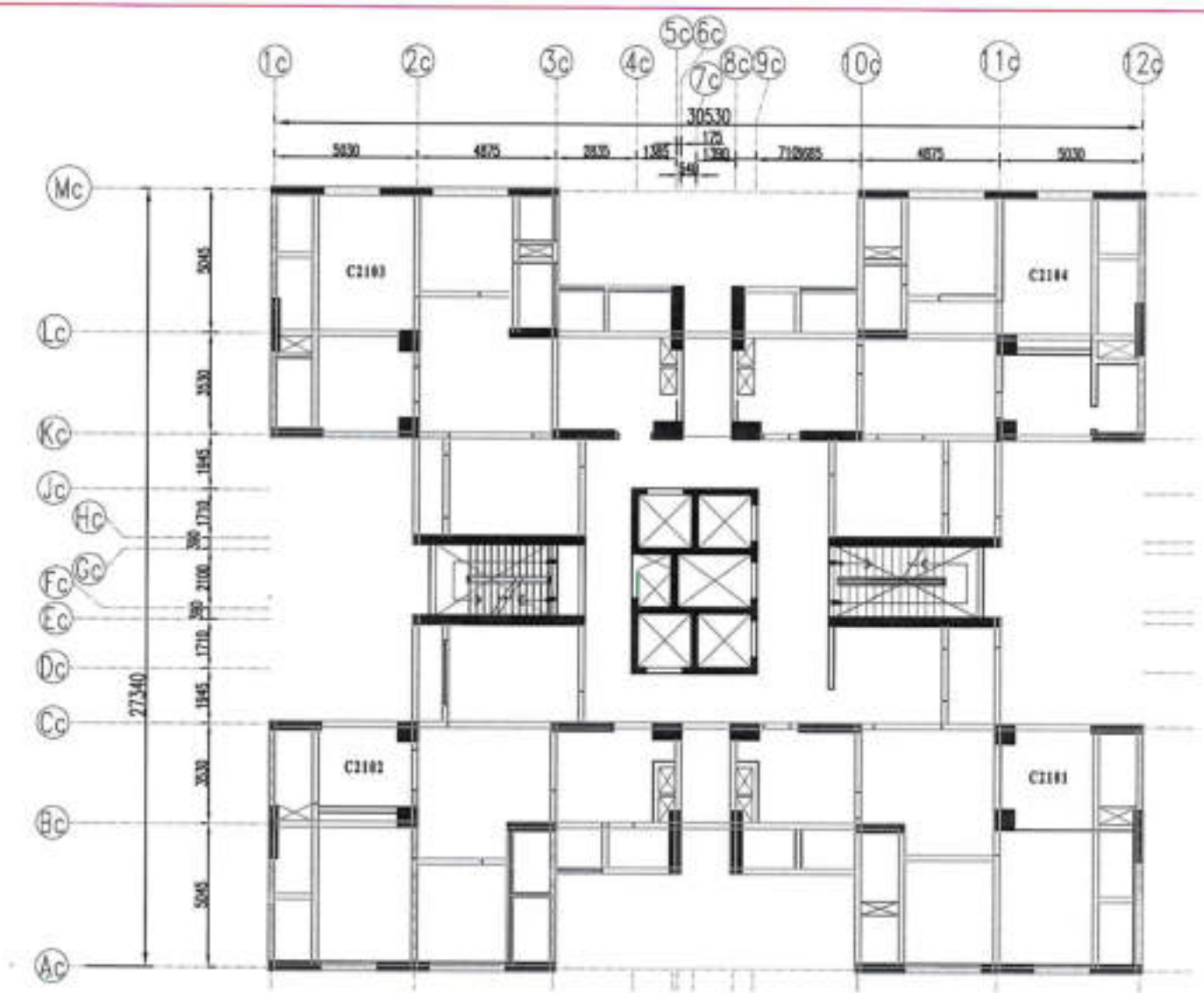

TOWER-C-NINETEENTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -19TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No :GL/19F/TC-21 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



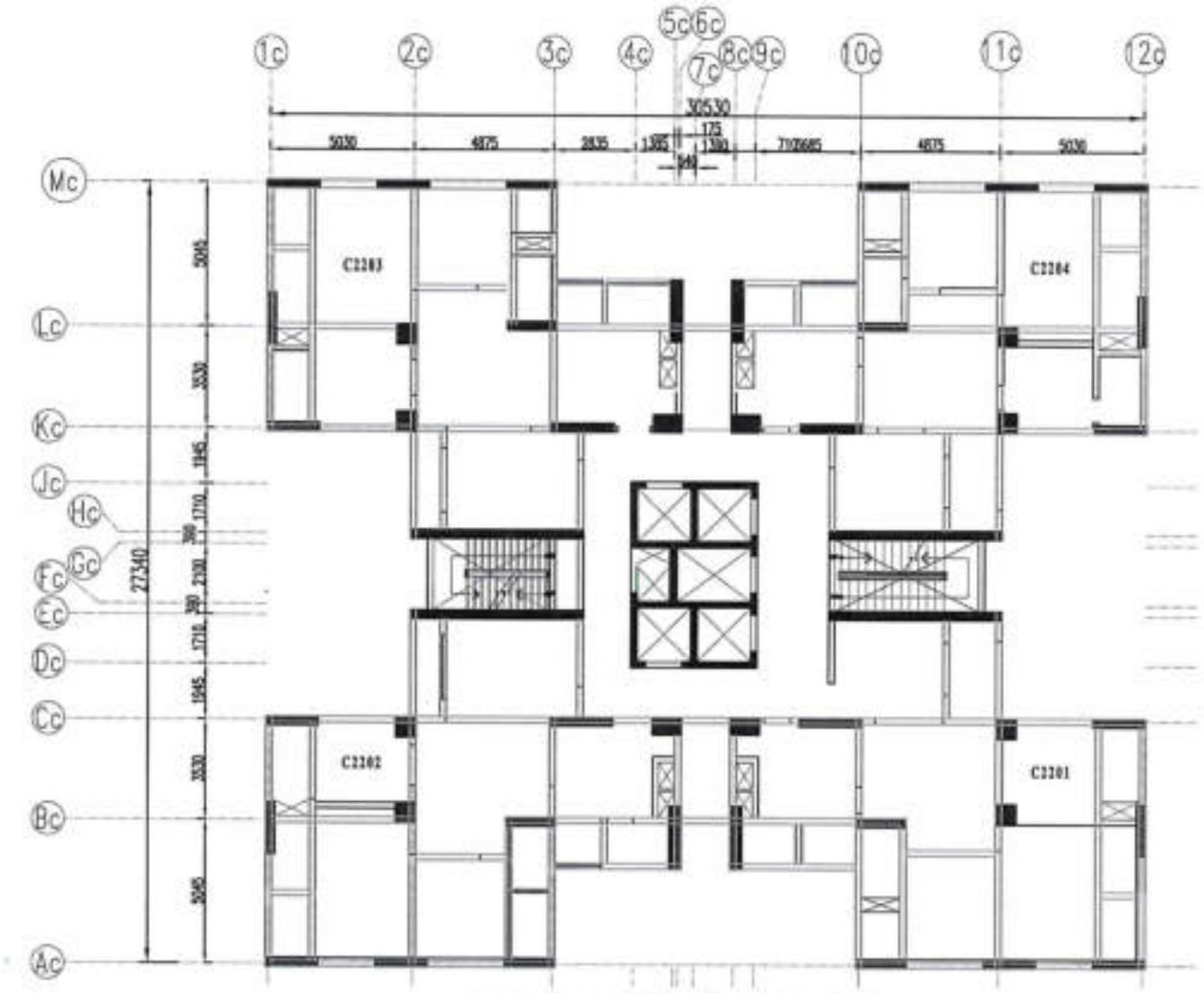

TOWER-C-TWENTIETH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -20TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/20F/TC-22 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



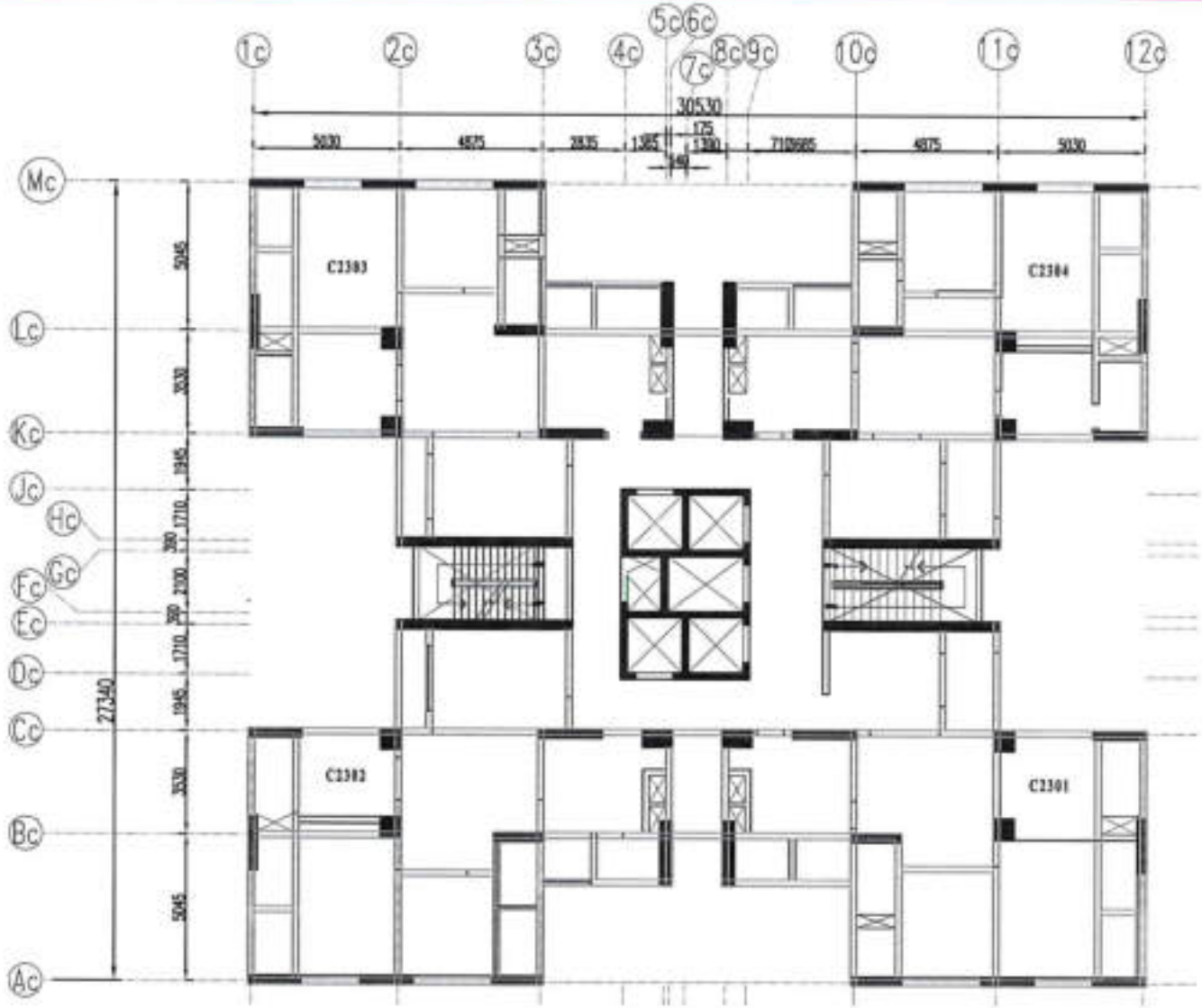

TOWER-C-TWENTY FIRST FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -21st FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 26-09-2022 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/21F/TC-23 | REV.No. RD |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



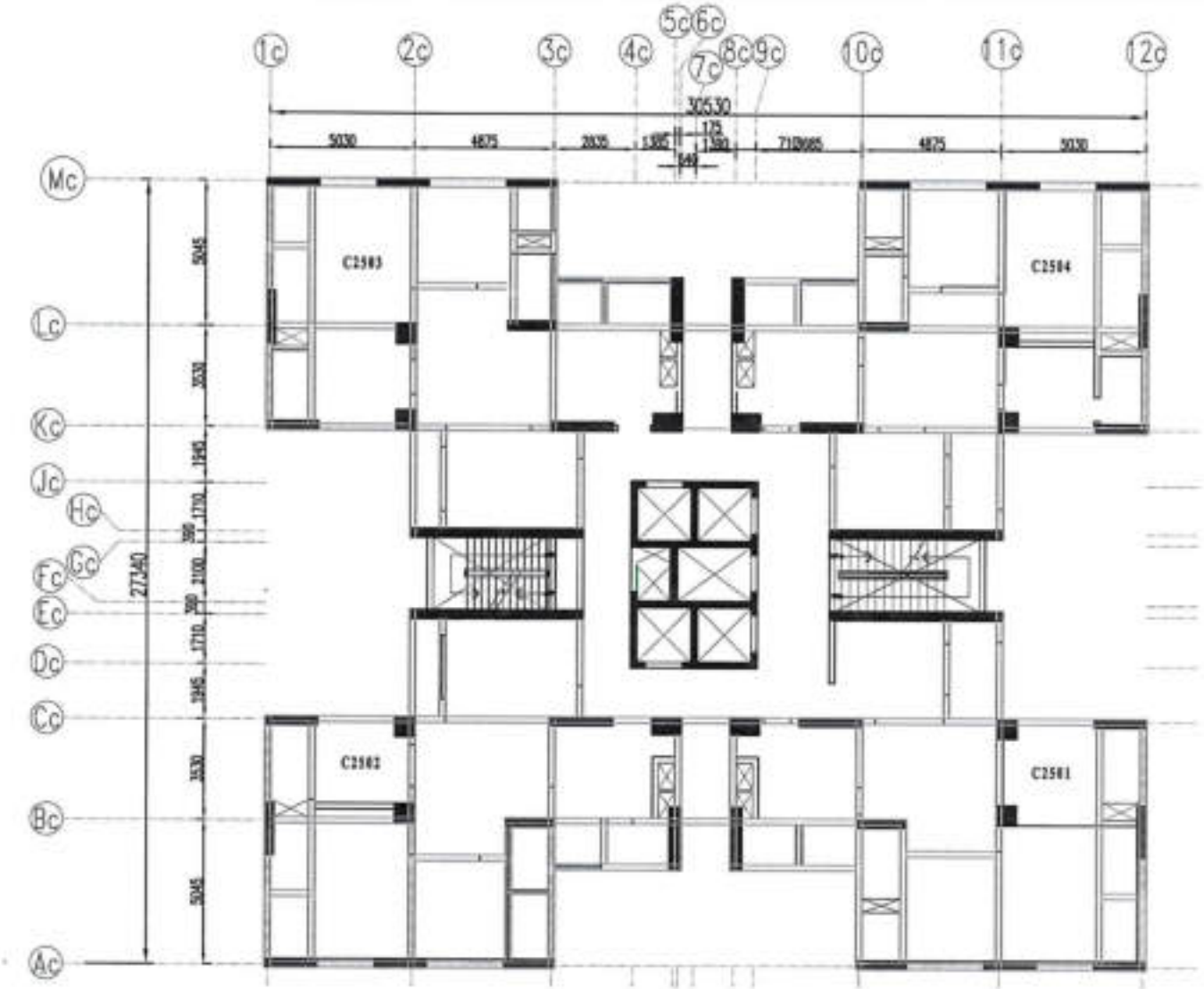

TOWER-C-TWENTY SECOND FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -22nd FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DNG. REF. No: GL/22F/TC-24 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. # 1/33, 13th Cross, Dr. Rajkumar Road 2nd Stage, Bangalore - 560 010. Tel.: 080-23468300 | | CONTRACT NO: 17671143 | |



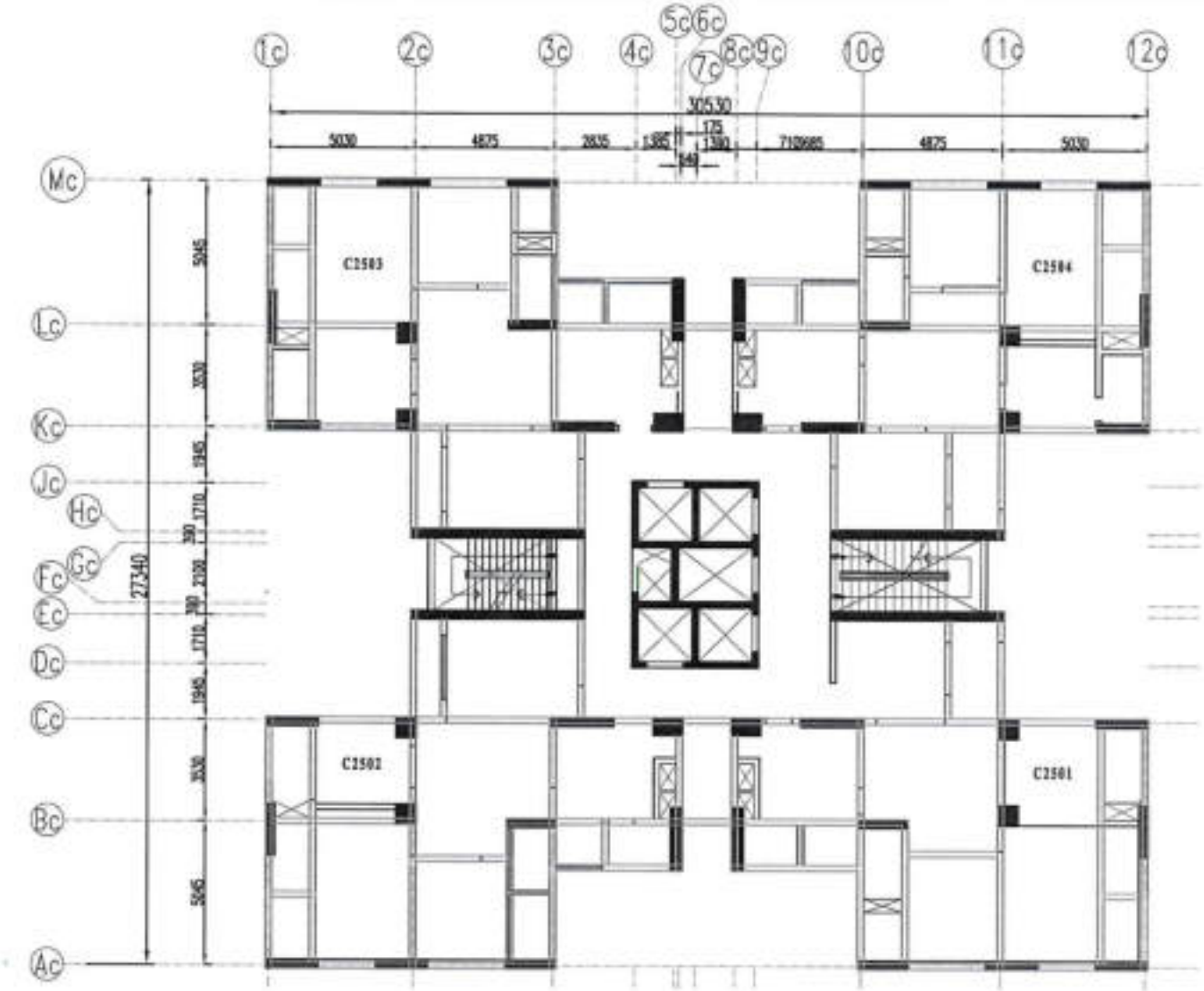

TOWER-C-TWENTY THIRD FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -23rd FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No :GL/23F/TC-25 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



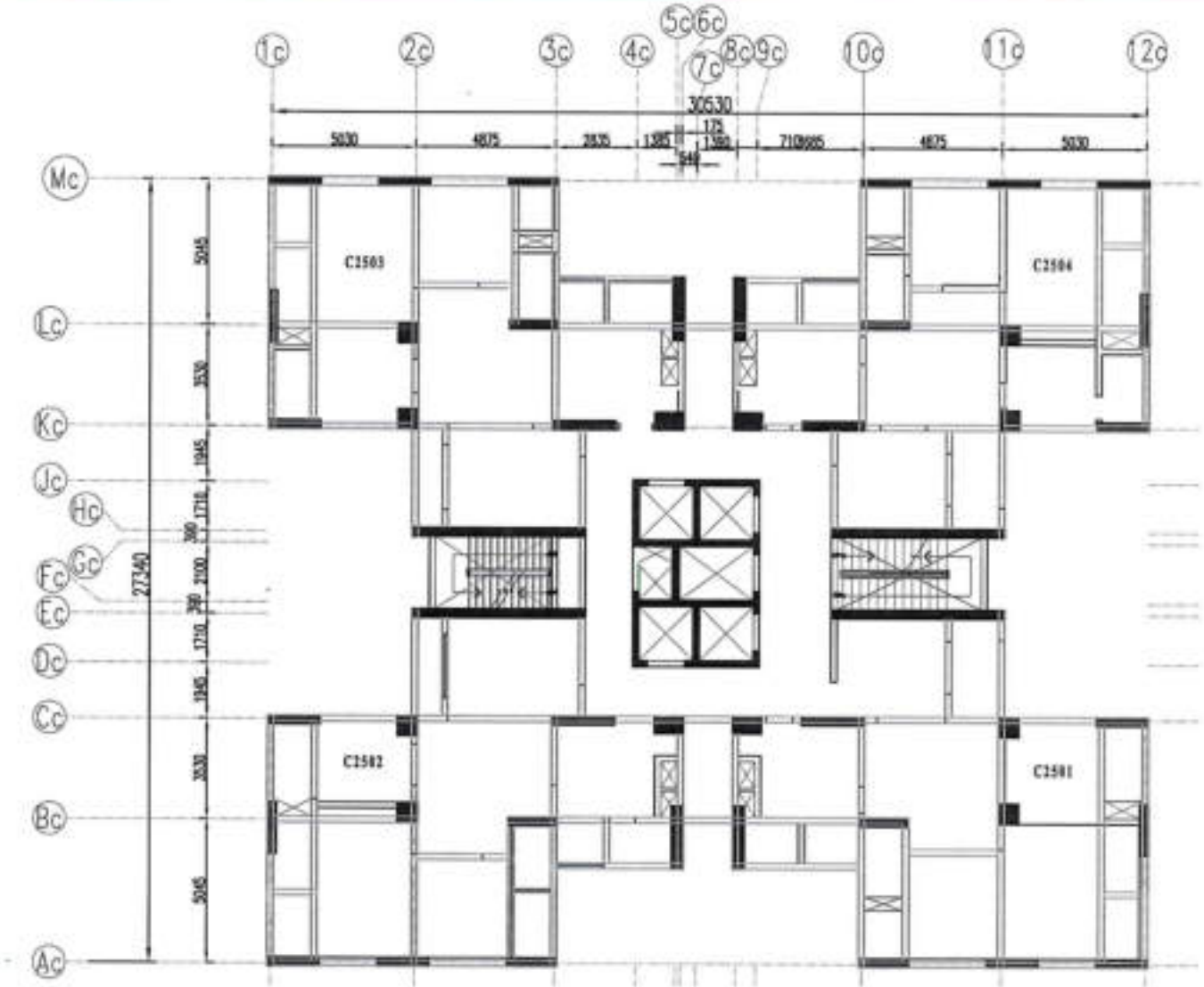

TOWER-C-TWENTY FOURTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -24th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/24F/TC-26 | REV.No: RD |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



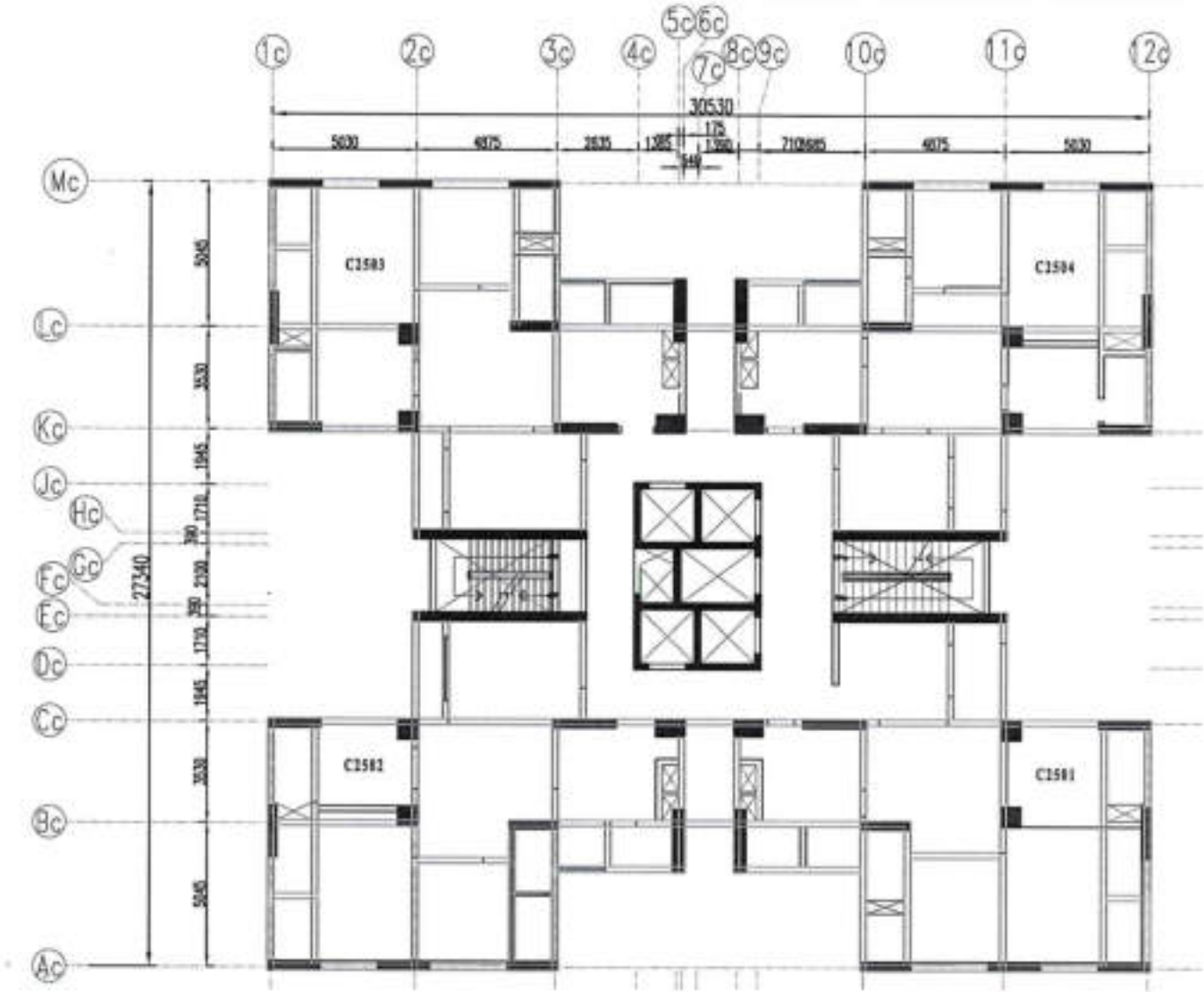

TOWER-C-TWENTY FIFTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -25th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 14-04-2022 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/25F/TC-27 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |



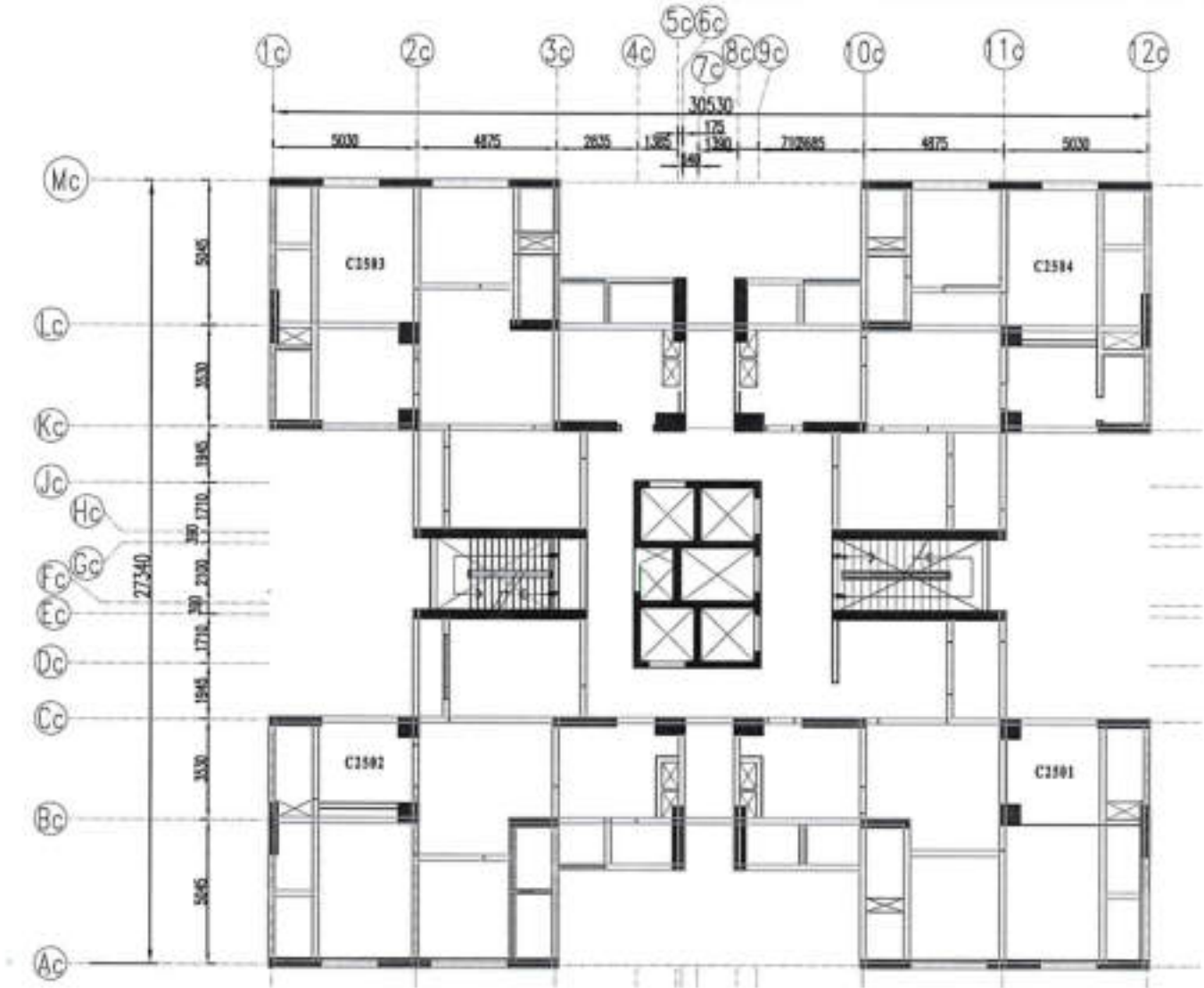

TOWER-C-TWENTY SIXTH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -26th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 28-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/26F/TC-28 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




TOWER-C-TWENTY SEVENTH FLOOR

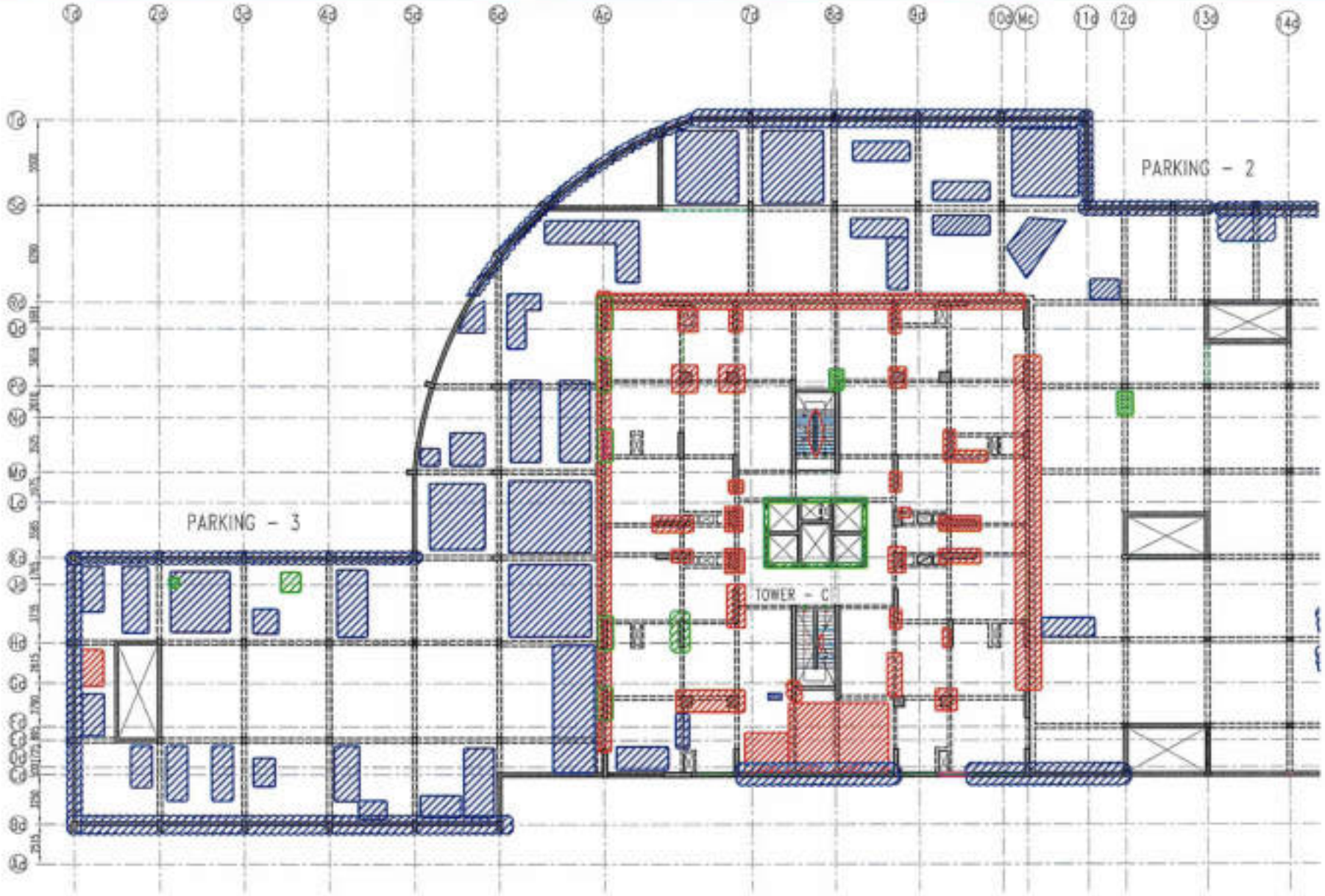
| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -27th FLOOR** | DRAWN: RSKK | CHECKED: CHP/MBS | SCALE: NTS | DATE: 26-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/27F/TC-29 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




TOWER-C-TWENTY NINETH FLOOR

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **GENERAL LAYOUT OF TOWER C -29th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GL/29F/TC-30 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |

# DISTRESS MAPPING SKETCHES




LEGEND:

SPALLING OF COVER CONCRETE/ EXPOSURE OF REBAR/ CORROSION CRACKS.

DAMPNESS/DAMP PATCHES/PEELING OF PAINT.

PATCH WORK DONE/TREATED MEMBERS.

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

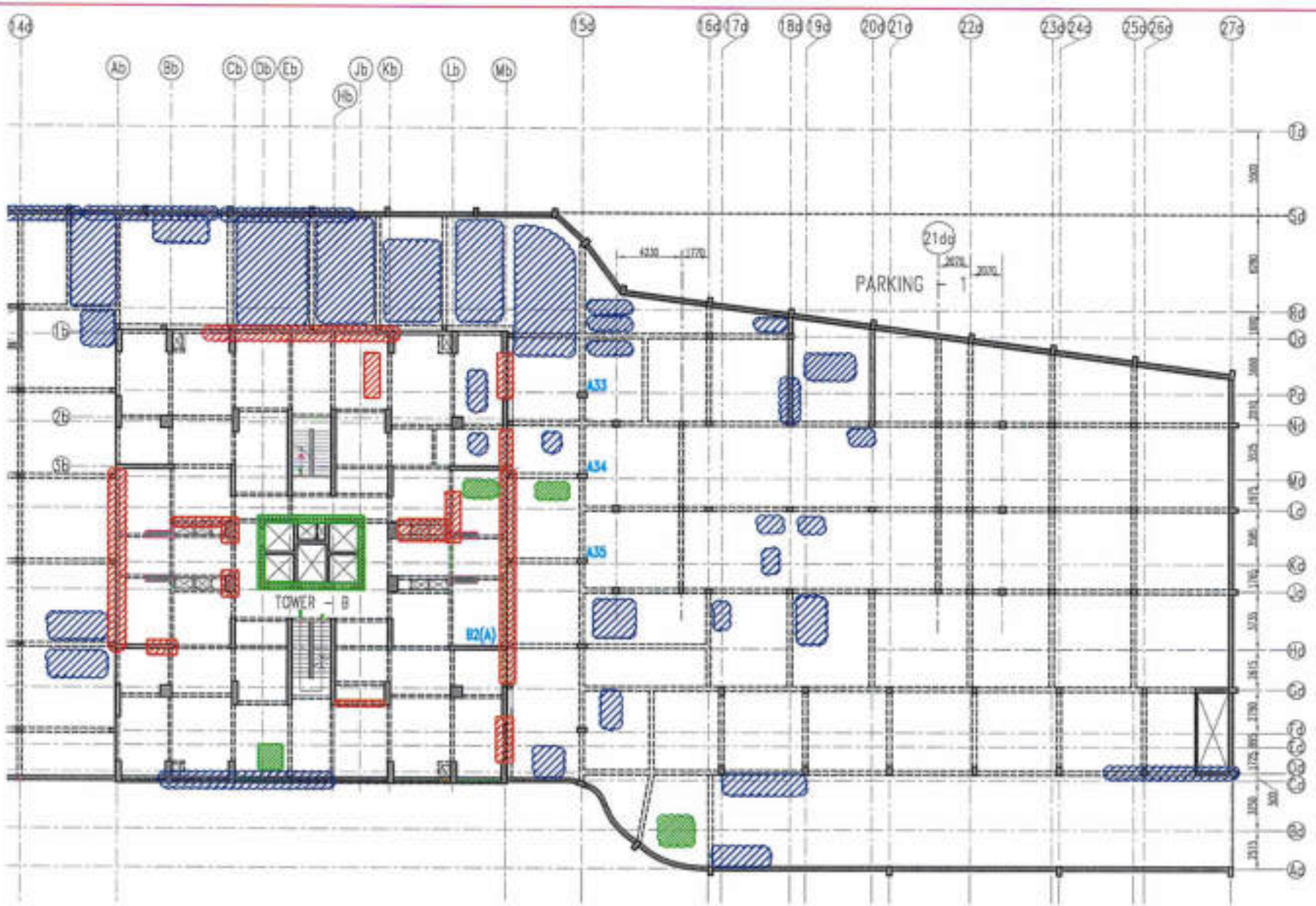
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL "CHANDRIKUNJ ARMY TOWERS" OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS MAPPING OF TOWER - C BASEMENT FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No : DM/BF-01 | REV.No. R0 |

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.
# 103, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070.
Tel. : 080-26695200

CONTRACT NO: 17671143




LEGEND:

- SPALLING OF COVER CONCRETE/ EXPOSURE OF REBAR/ CORROSION CRACKS.
- DAMPNESS/DAMP PATCHES/PEELING OF PAINT.
- PATCH WORK DONE/TREATED MEMBERS.

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

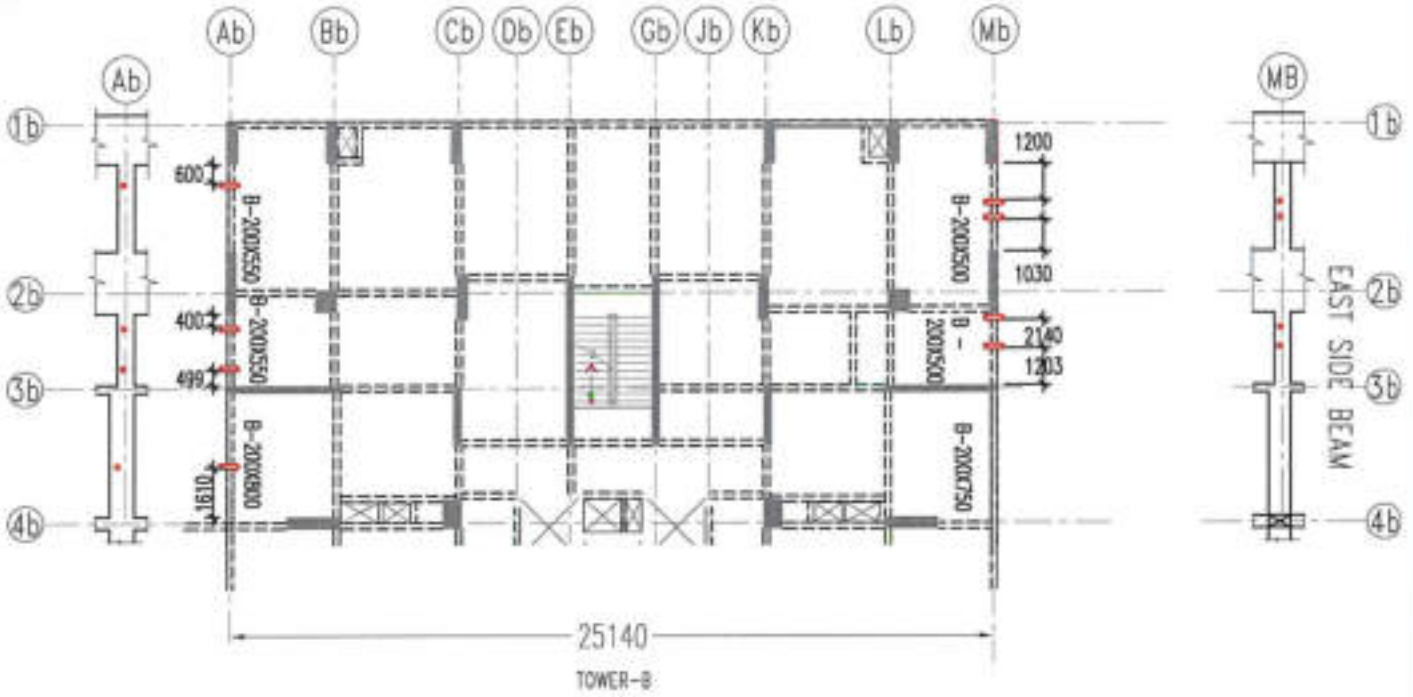
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL "CHANDRIKUNJ ARMY TOWERS" OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

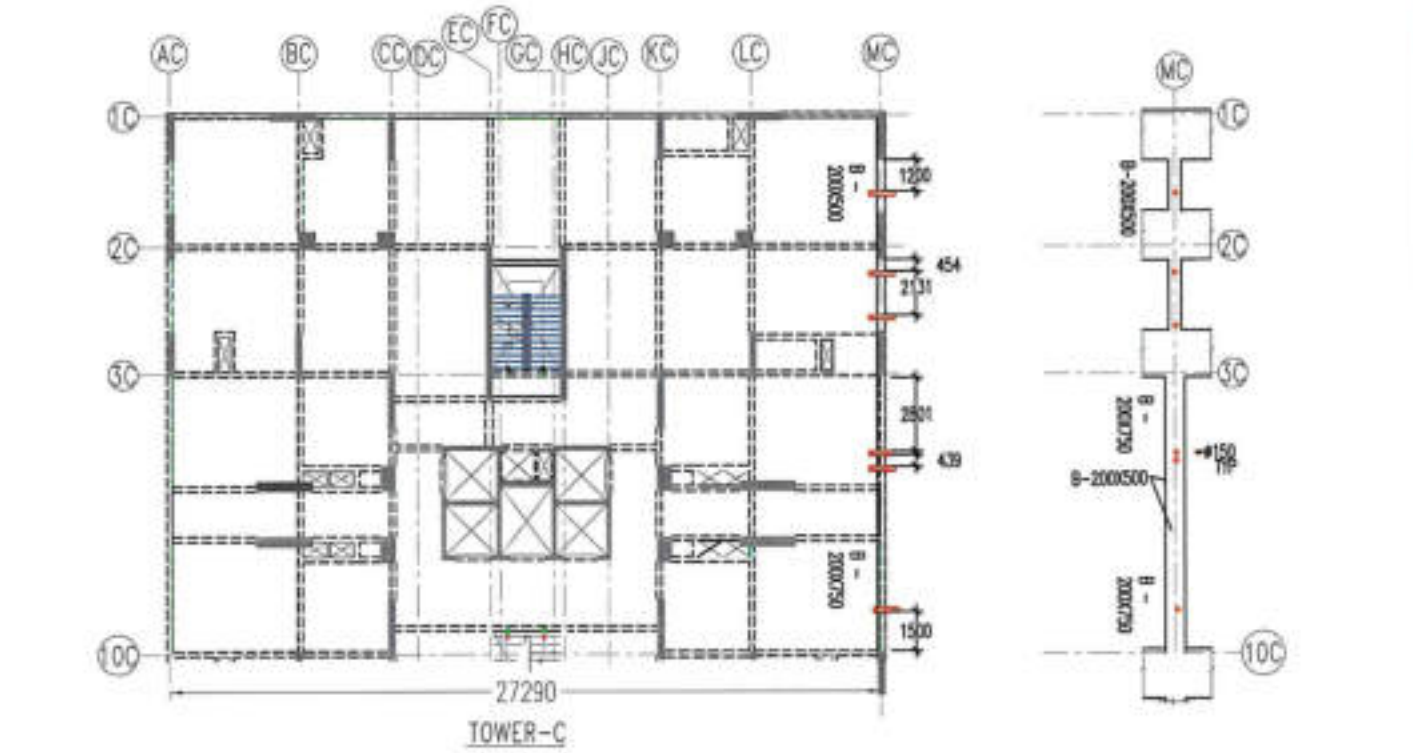
TITLE: **DISTRESS MAPPING OF TOWER - B BASEMENT FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No : DM/BF-01 | REV.No. R0 |

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143



| | | | | | |
|---|---|---|---|---|---|
| TITLE | **FIRE PIPELINE CROSSING IN BEAMS BASEMENT FLOOR** | | | | |
| | | DATE | REV | DESCRIPTION | |
| CLIENT | M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: BSNX | CHECKED: CHD/MBS | SCALE: NTS | DATE: 26-06-2020 |
| | | DESIGNED: | APPROVED: AJ/Dr.KS | DWG. REF. No. DM/BF-a-01 | REVN. 00 |
| PROJECT | STRUCTURAL ASSESSMENT OF RESIDENTIAL "CHANDERKUNJ ARMY TOWERS" OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |

TOWER-C-GROUND FLOOR PLAN

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - GROUND FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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|---|---|---|
| SCALE: NTS | DATE: 24-04-2023 | |
| DWG. REF. No: CM/GF/TC-02 | REV.No. R0 | |
| CONTRACT NO: 17671143 | | |

TOWER-C-FIRST FLOOR PLAN

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - FIRST FLOOR** | DRAWN: RSAK / CHECKED: CHR/MBS / APPROVED: AJ/Dr.KS | SCALE: NTS / DATE: 24-04-2023 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | | DWG. REF. No: DM/1F/TC-03 / REV.No. R0 |
| | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |

TOWER-C-SECOND FLOOR PLAN

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - SECOND FLOOR** | DRAWN: RSHK / CHECKED: CHR/MBRS / SCALE: NTS / DATE: 24-08-2023 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | APPROVED: AJ/DrJKS / DWG. REF. No : DM/2F/TC-04 / REV.No. R0 | |
| | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 | |

TOWER-C-THIRD FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - THIRD FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DNG. REF. No.: DM/3F/TC-05 | REV.No.: R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |

TOWER-C-THIRD FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - THIRD FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/DrKS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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| SCALE: NTS | DATE: 29-09-2023 |
| DWG. REF. No: DM/3F/TC-05 | REV.No. R0 |
| CONTRACT NO: 17671143 | |

TOWER-C-FOURTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -4TH FLOOR** | DRAWN: RISHI | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.RS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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|---|---|---|---|
| SCALE: NTS | DATE: 29-04-2023 | | |
| DWG. REF. No: DM/4F/TC-06 | REV.No: R0 | | |
| CONTRACT NO: 17671143 | | | |

TOWER-C-FIFTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -5TH FLOOR** | DRAWN: RSMK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. REF. No: DM/5F/TC-07 | REVISION: R0 |
| | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 | |

TOWER-C-SIXTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -6TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No : DM/6F/TC-08 | REV.No. R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671145

TOWER-C-SEVENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -7TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | |

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| SCALE: NTS | DATE: 24-08-2021 |
| DWG. REF. No : DM/7F/TC-09 | REV.No: R0 |
| CONTRACT NO: 17671143 | |

TOWER-C-EIGHTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -8TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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|---|---|
| SCALE: NTS | DATE: 24-04-2021 |
| DWG. REF. No : DM/8F/TC-10 | REV.No: R0 |
| CONTRACT NO: 17671143 | |

TOWER-C-NINETH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -9TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MDS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/9F/TC-11 | REV.No. R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.
F 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070
Tel. : 080-26695555

CONTRACT NO: 17671143

TOWER-C-TENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -10TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSK/K | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.JKS | DWG. REF. No: DM/10F/TC-12 | REV.No. R10 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

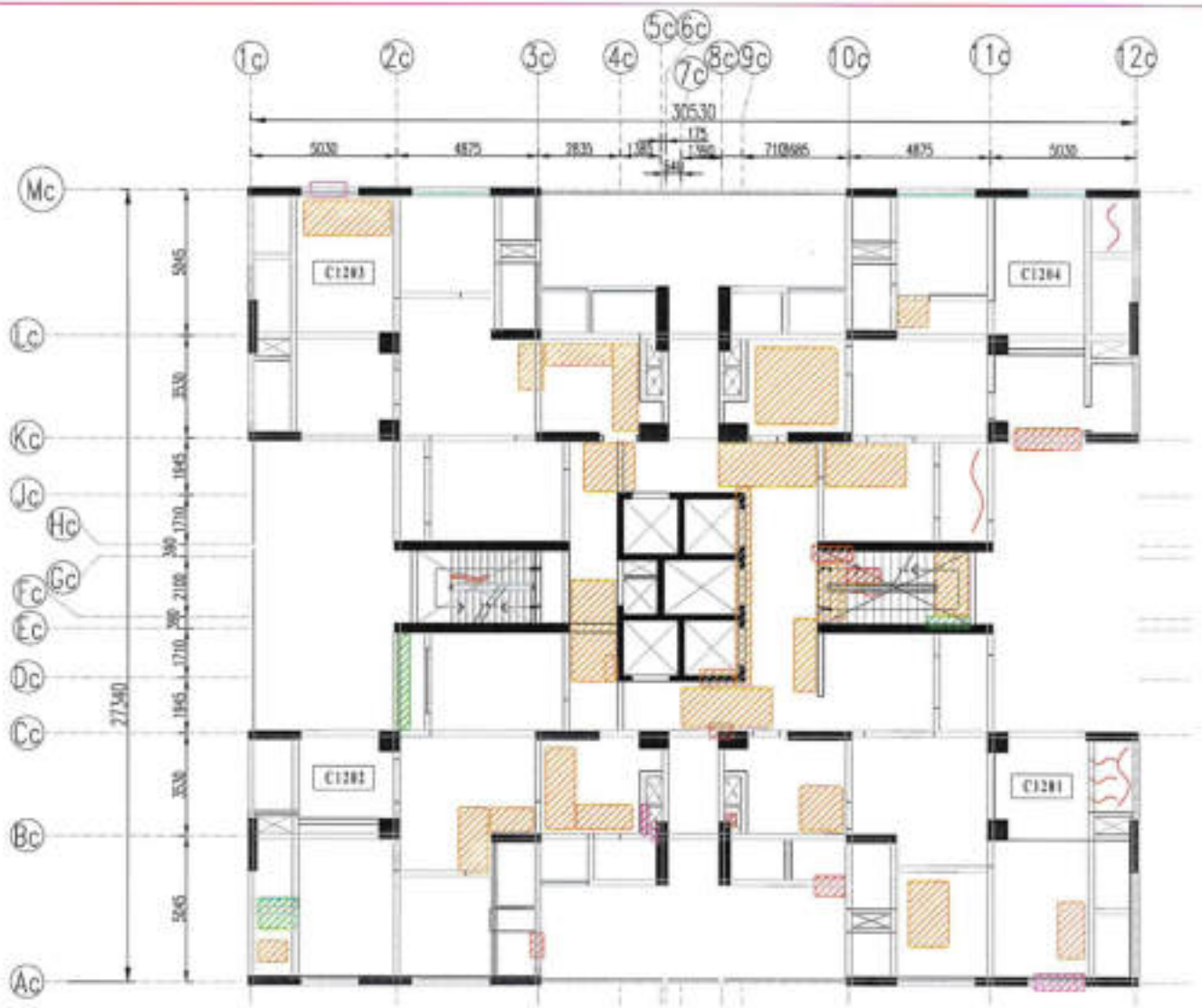
CONTRACT NO: 17671143

TOWER-C-ELEVENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -11TH FLOOR** | DRAWN: RSAH / CHECKED: CHR/MRS / APPROVED: AJ/Dr.KS | SCALE: NTS / DATE: 24-04-2023 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | | DWG. REF. No: OM/11F/TC-13 / REV.No: R0 |
| | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 |

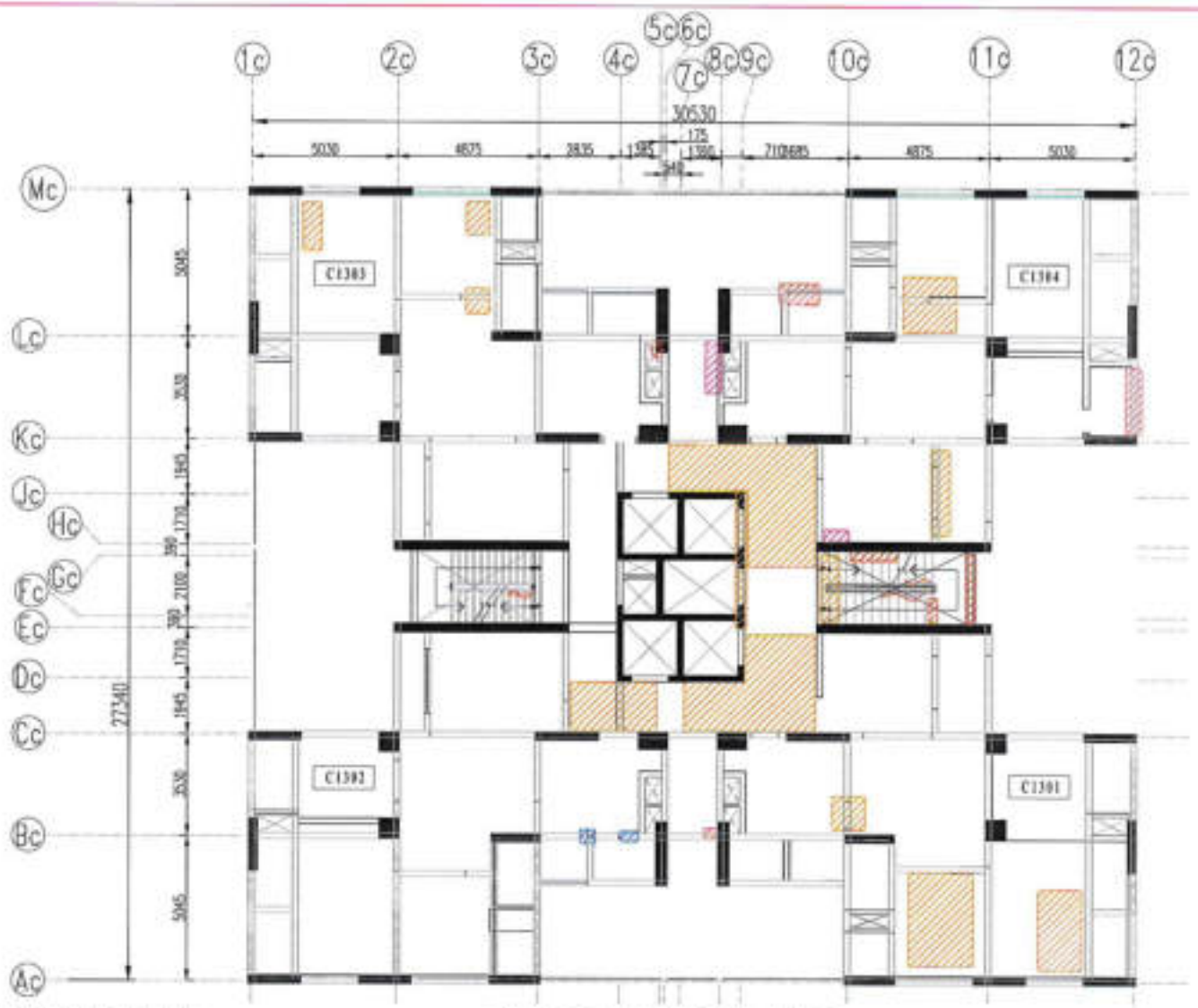



TOWER-C-TWELVETH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -12TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. REF. No : DM/12F/TC-14 | REV.No. R0 |
| CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




TOWER-C-THIRTEENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS,/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

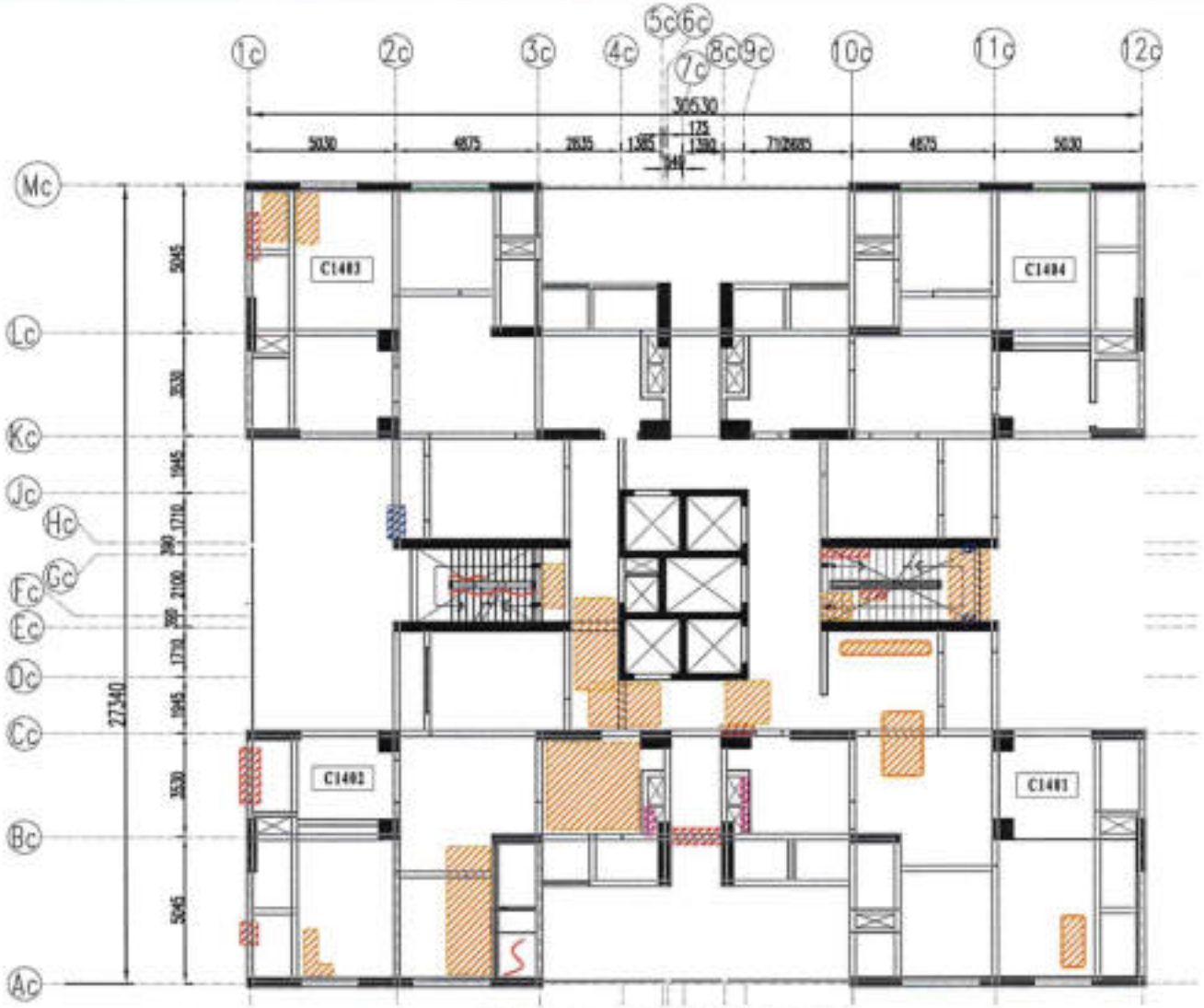
TITLE: **DISTRESS LAYOUT OF TOWER C -13TH FLOOR**

DRAWN: HSH/K | CHECKED: CHR/MBS | SCALE: NTS | DATE: 29-04-2023

APPROVED: AJ/Dr.HS | DWG. REF. No: DM/13F/TC-15 | REV.No. R0

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143




TOWER-C-FOURTEENTH FLOOR

**LEGEND:**

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -14TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSHK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-06-2022 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/14F/TC-16 | REV.No. R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143

TOWER-C-FIFTEENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

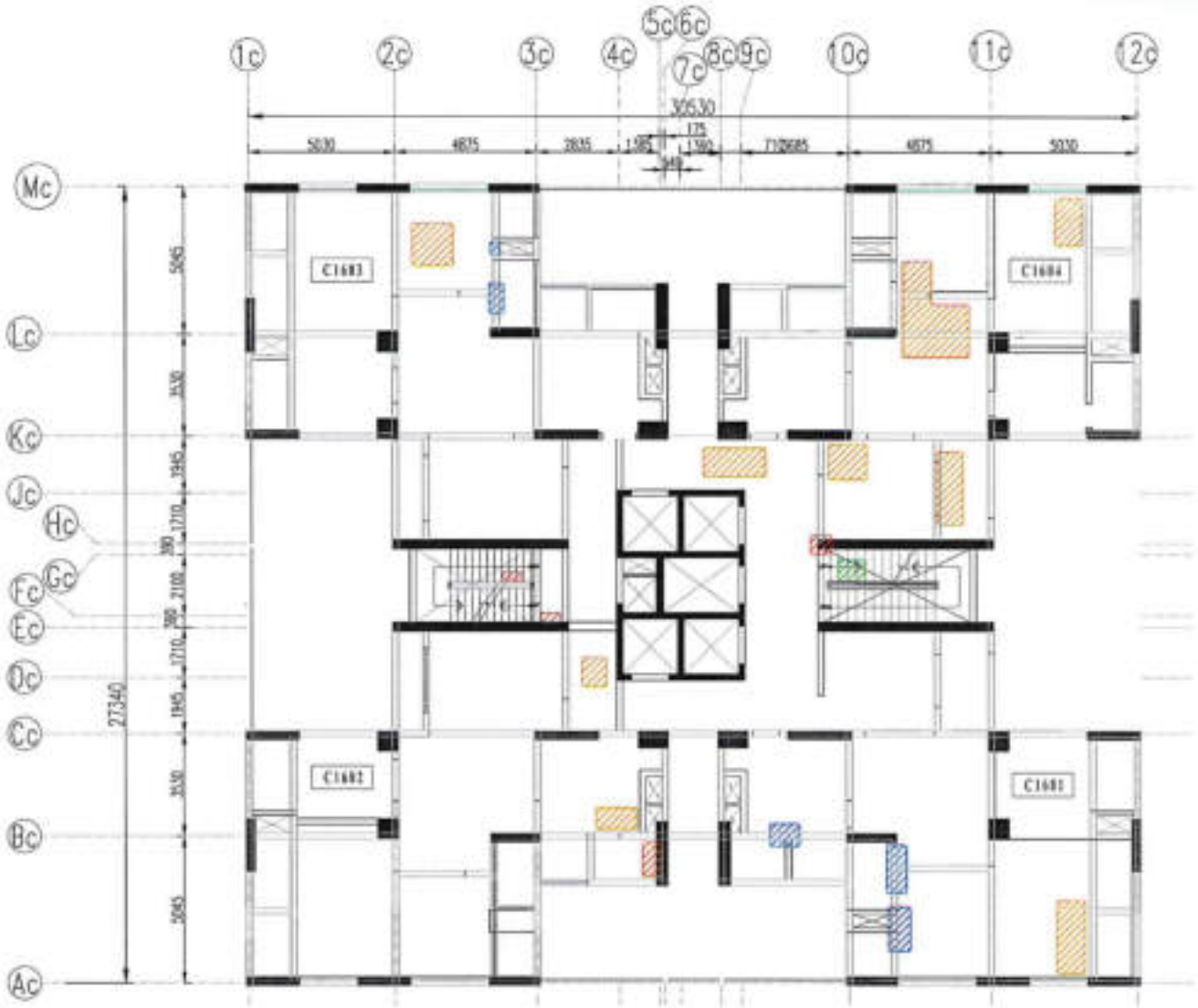
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -15TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHK/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/15F/TC-17 | REV.No. R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143




TOWER-C-SIXTEENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -16TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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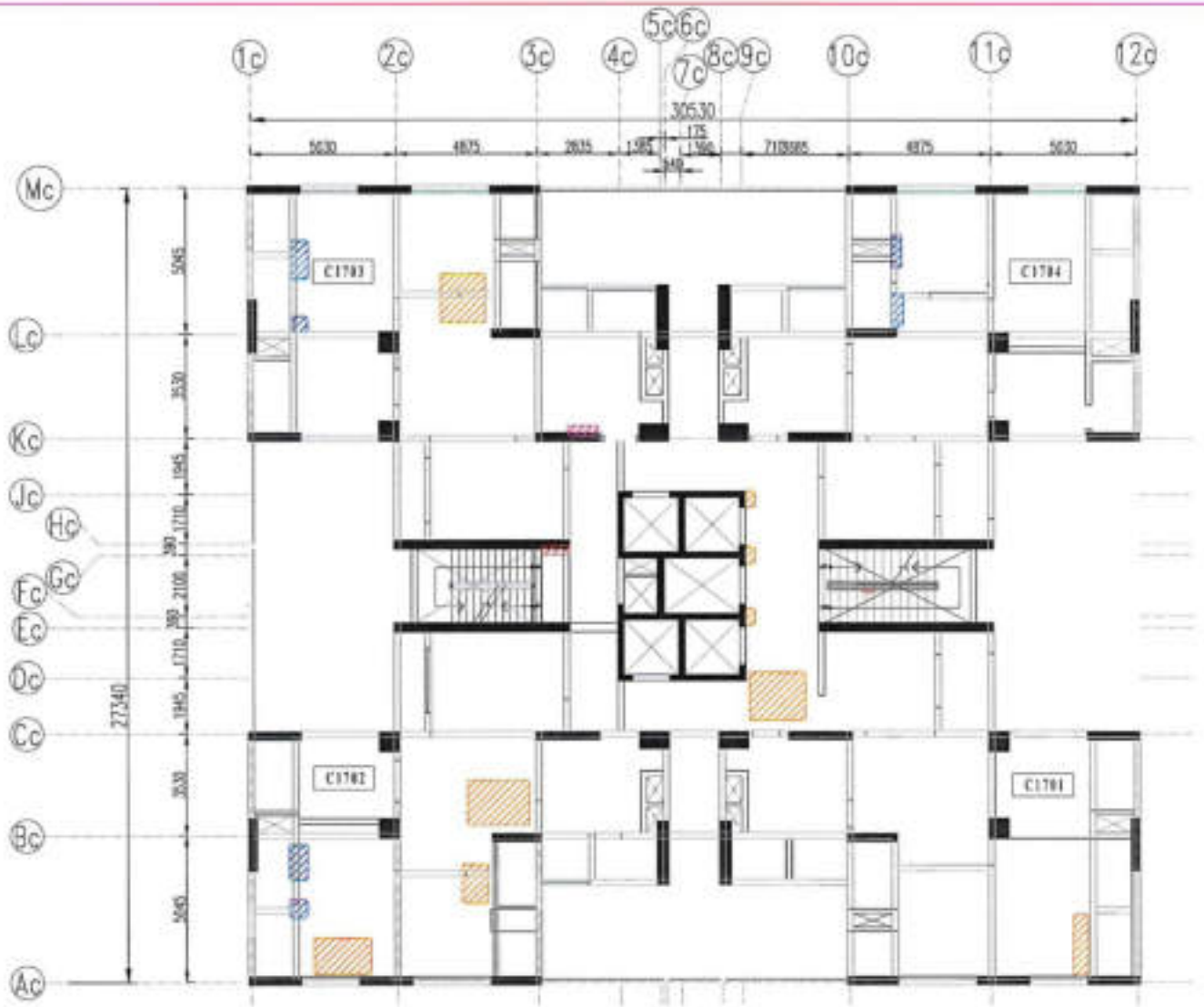
|---|---|---|
| SCALE: NTS | DATE: 24-04-2023 | |
| DWG. REF. No: DM/16F/TC-1B | REV.No. R0 | |
| CONTRACT NO: 17671143 | | |




TOWER-C-SEVENTEENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

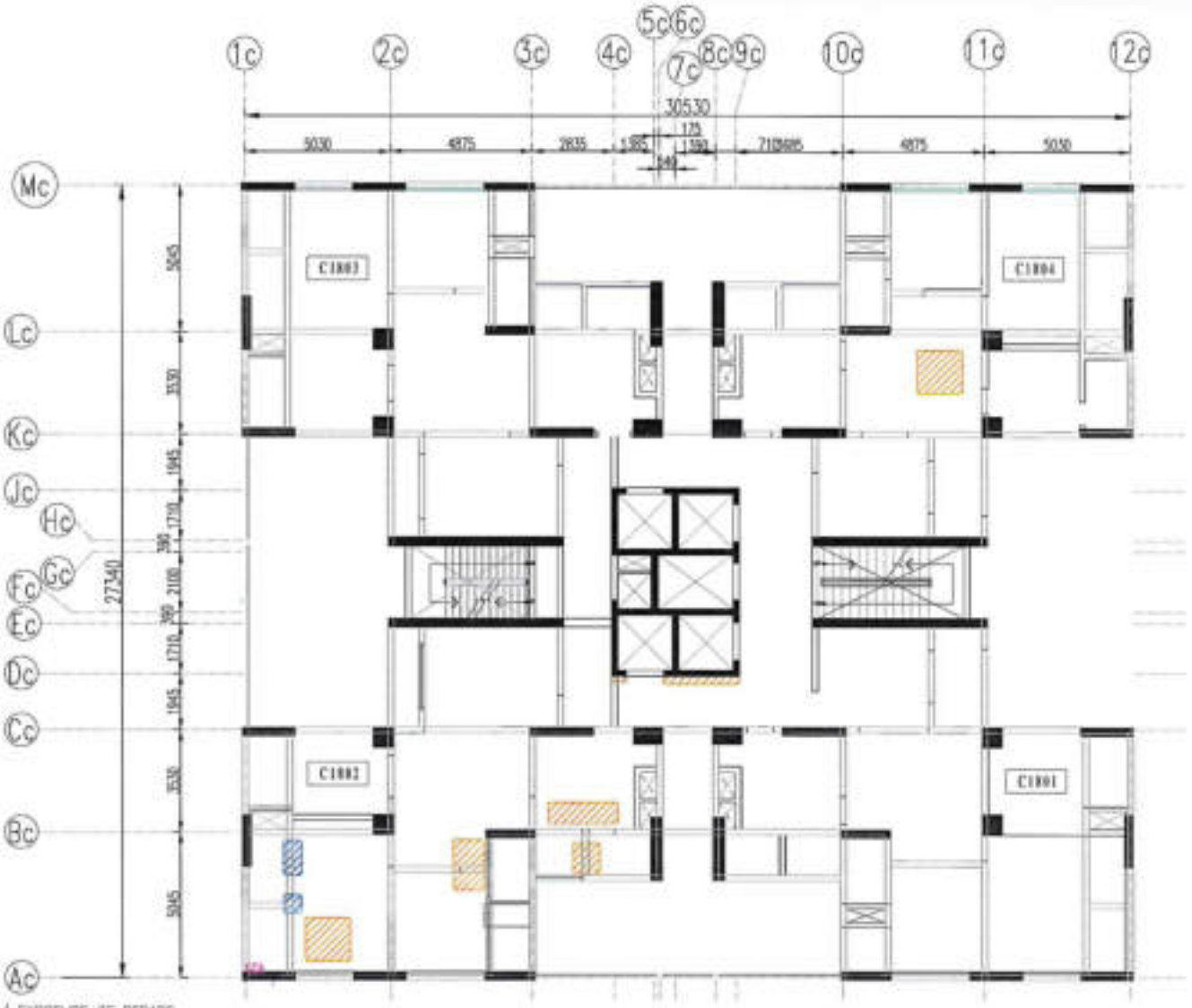
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -17TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: HSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/17F/TC-19 | REV.No: R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143




TOWER-C-EIGHTEENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

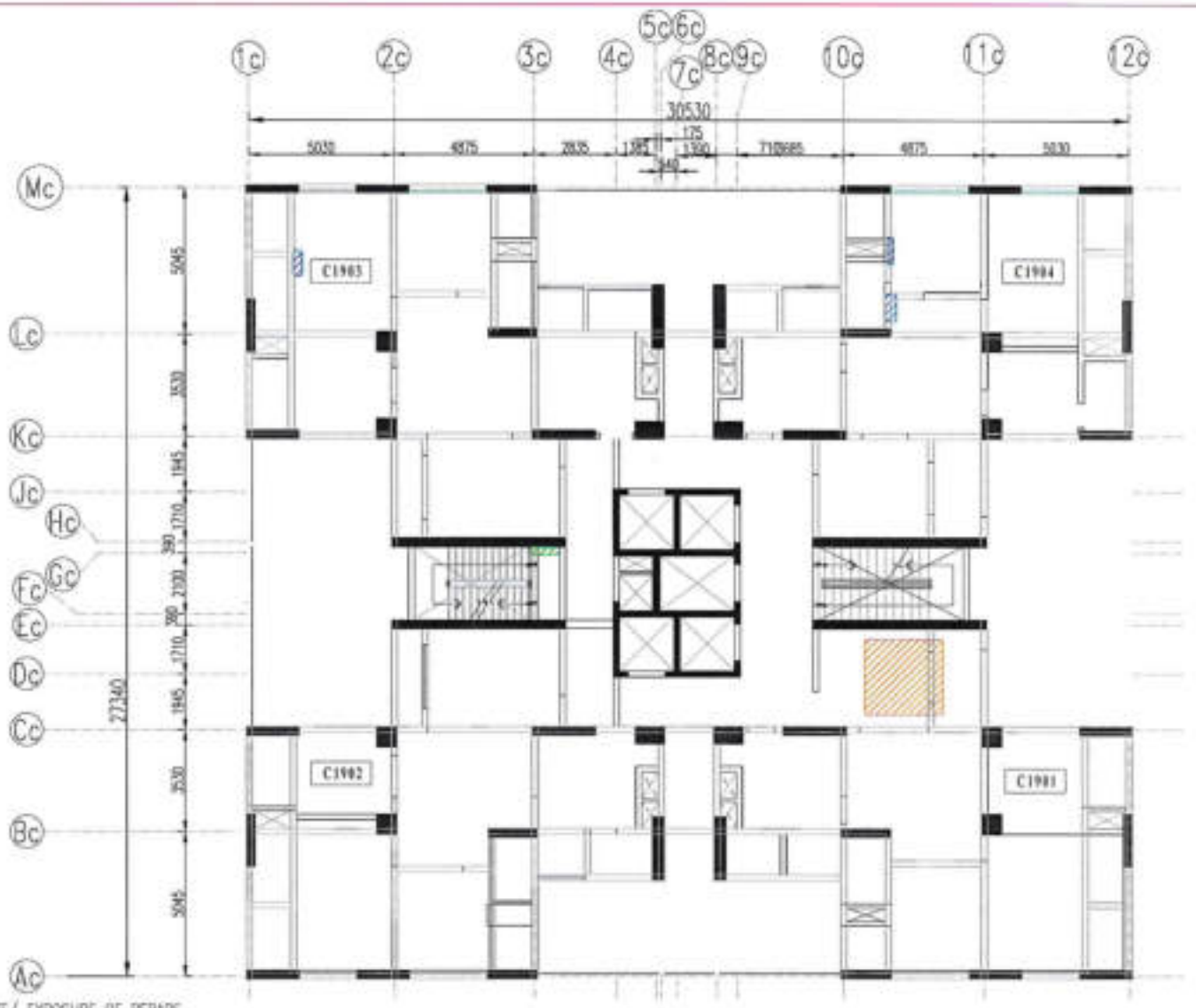
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -18TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/DMS | DWG. REF. No: DM/18F/TC-20 | REV.No. R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143




TOWER-C-NINETEENTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

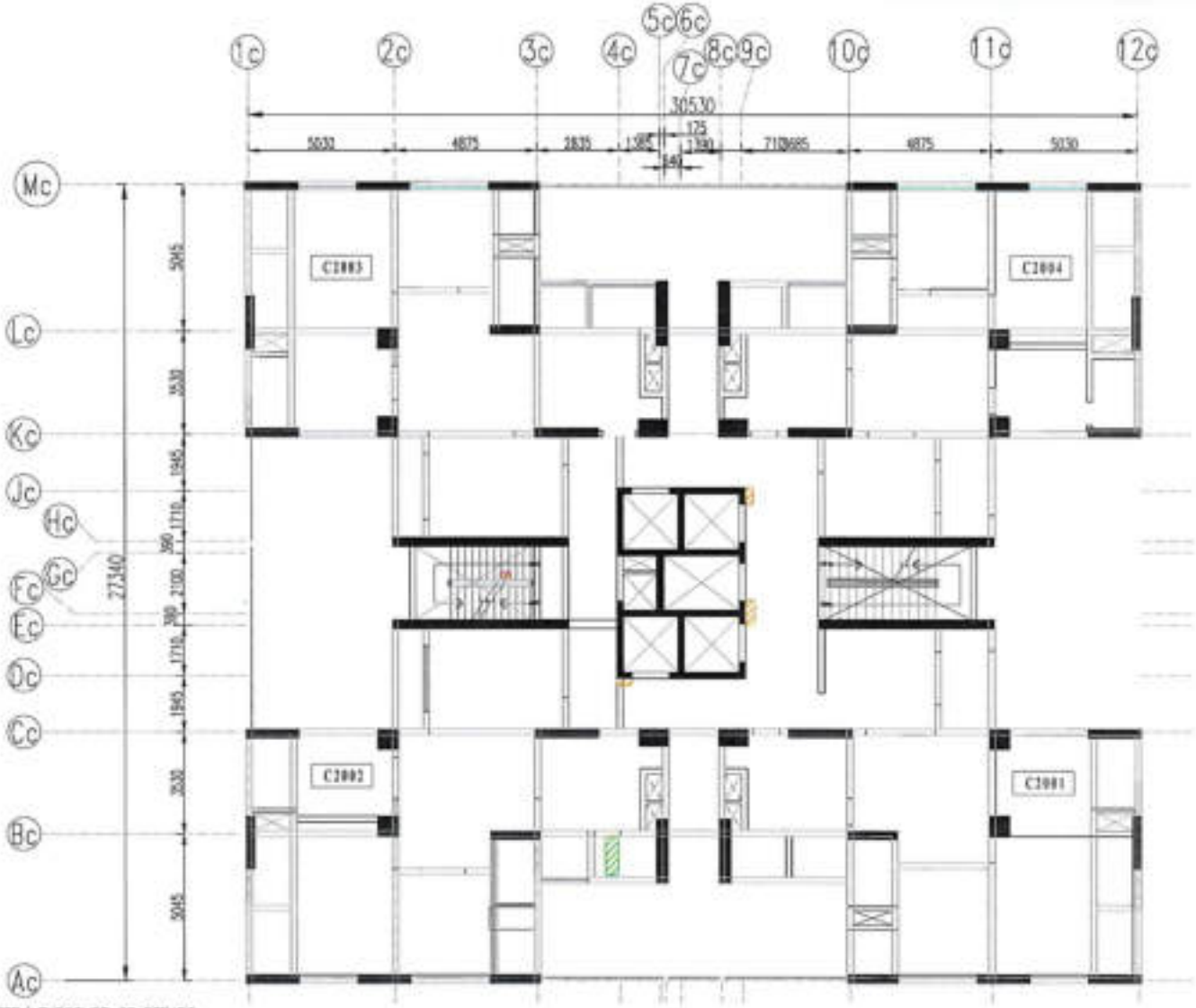
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERSUN) ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ESLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -19TH FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No: CM/19F/TC-21 | REV.No. R0 |

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143




TOWER-C-TWENTIETH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -20TH FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/DHKS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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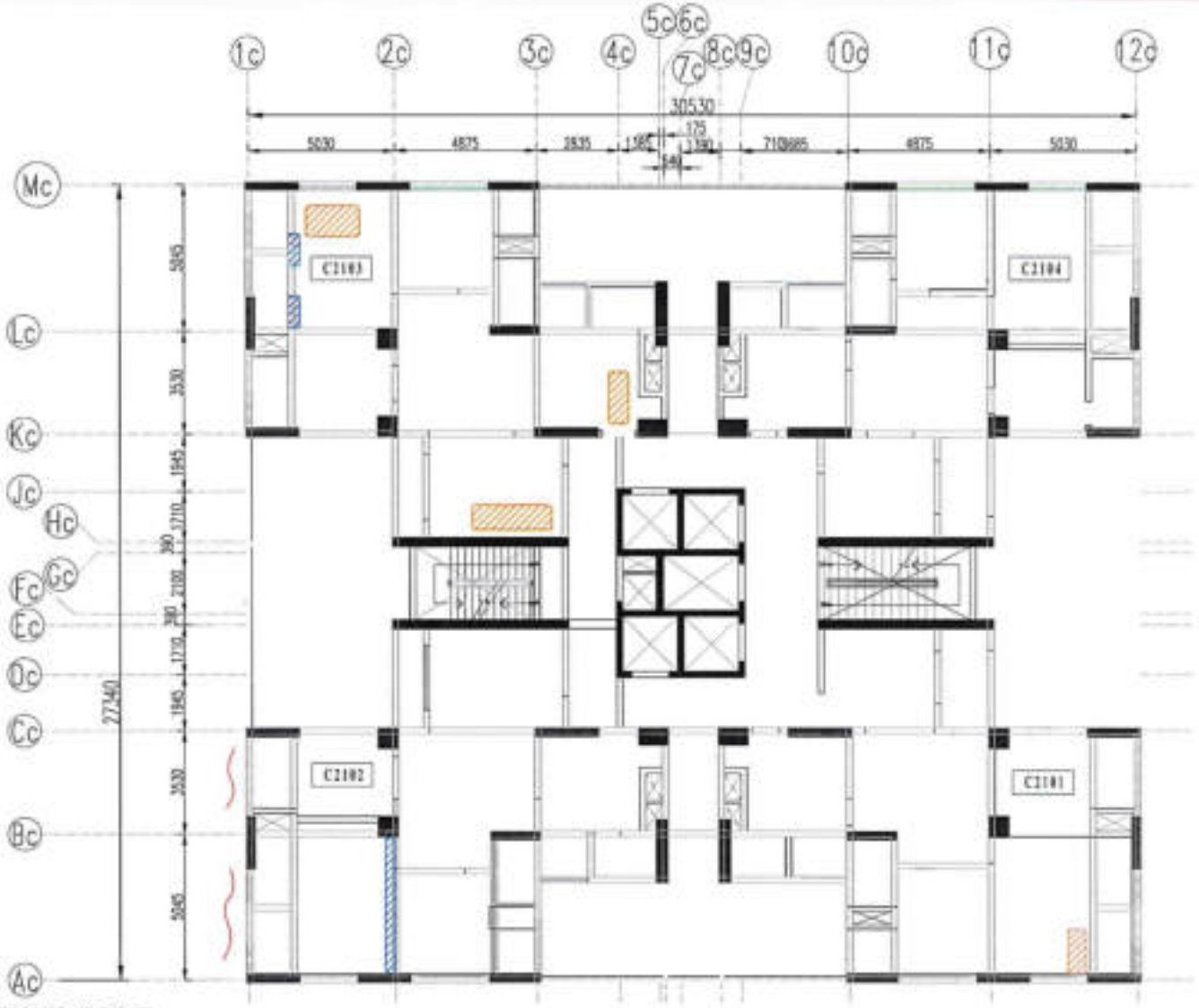
|---|---|---|
| SCALE: NTS | DATE: 24-04-2021 | |
| DWG. REF. No: CM/2DF/TC-22 | REV No: R0 | |
| CONTRACT NO: 17671143 | | |

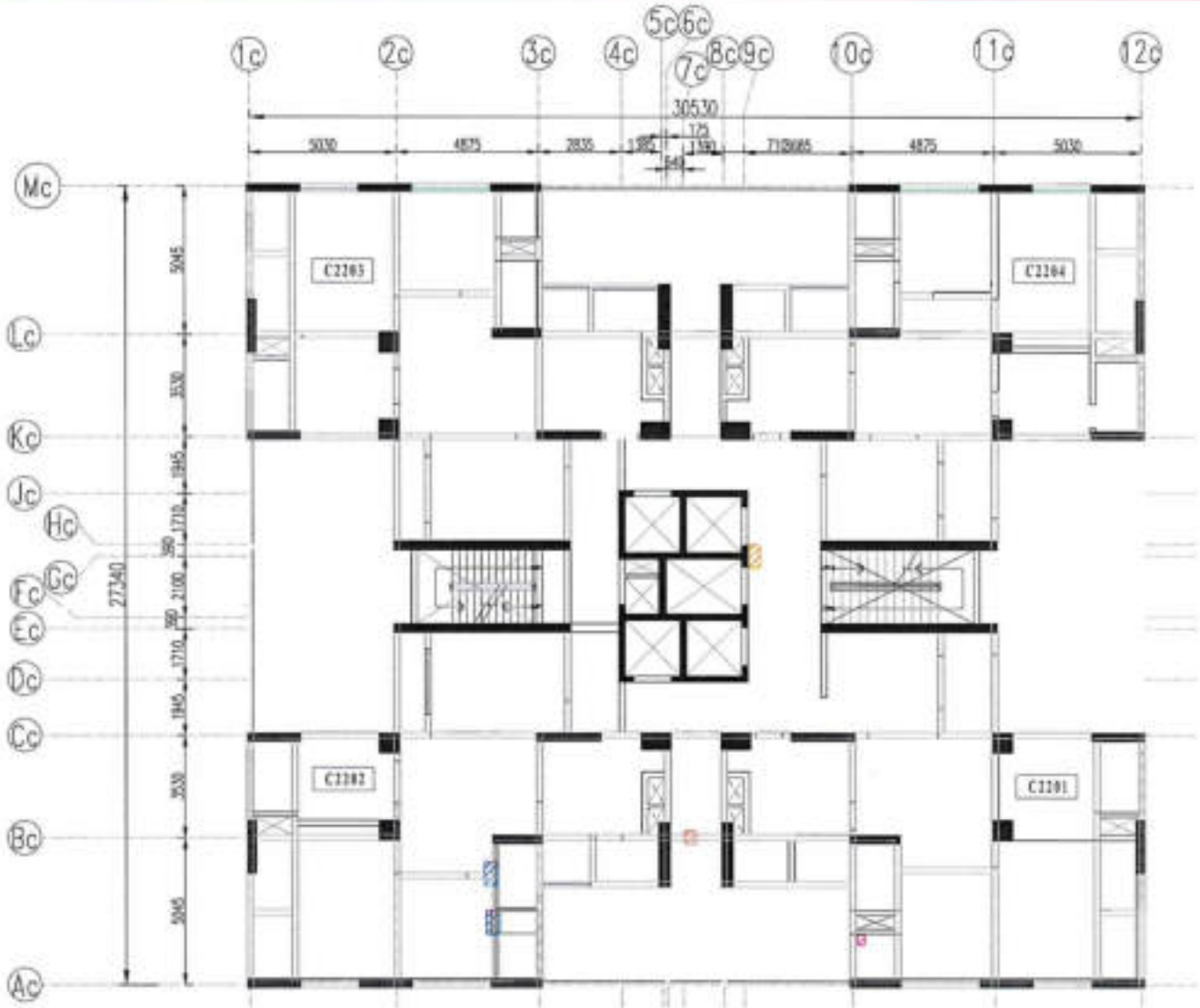



TOWER-C-TWENTY FIRST FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -21st FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 29-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/21F/TC-23 | REV.No. R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




TOWER-C-TWENTY SECOND FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

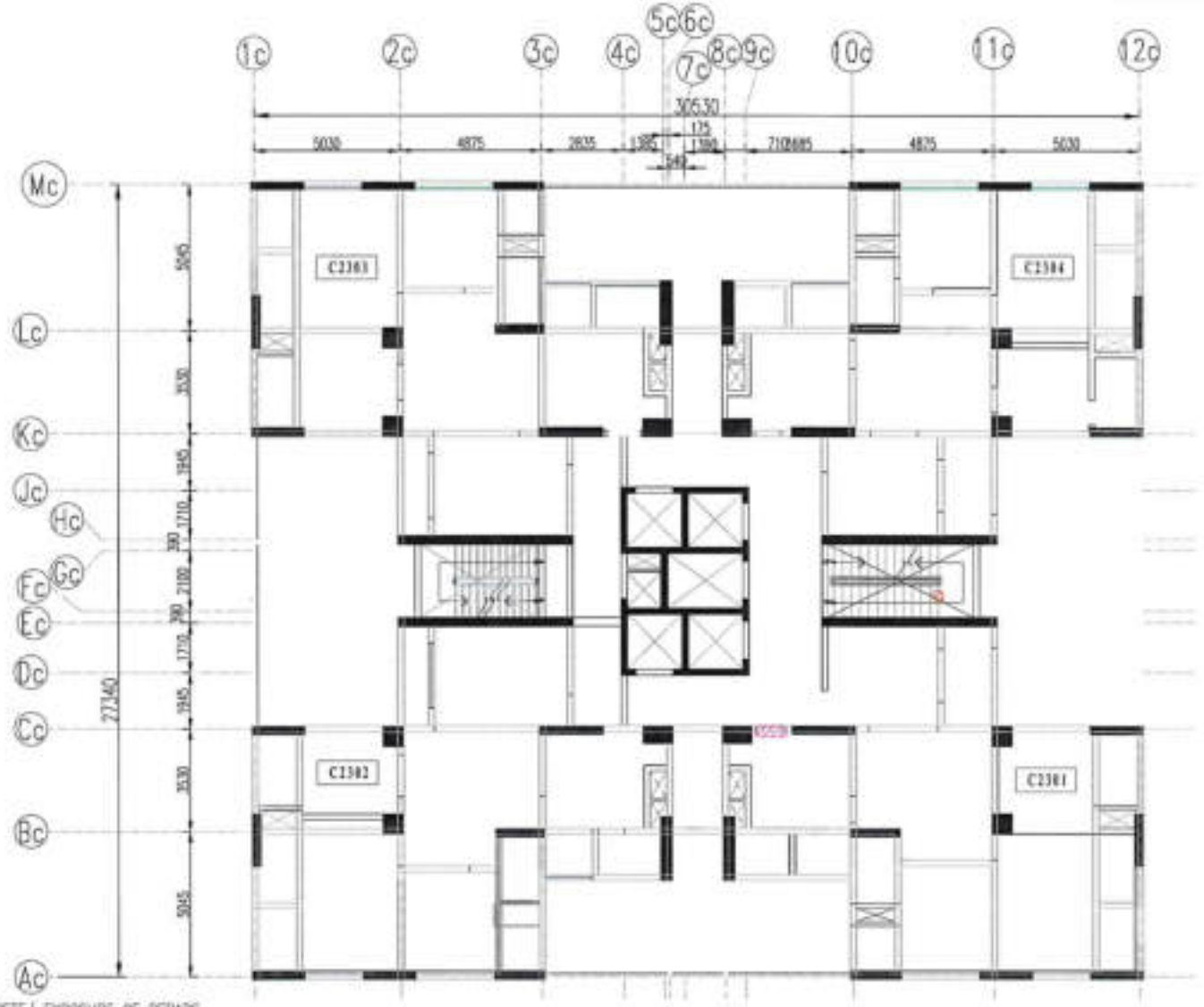
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE: **DISTRESS LAYOUT OF TOWER C -22nd FLOOR**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 29-09-2023 |
| | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/22F/TC-24 | REV.No: RD |

CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD.

CONTRACT NO: 17671143



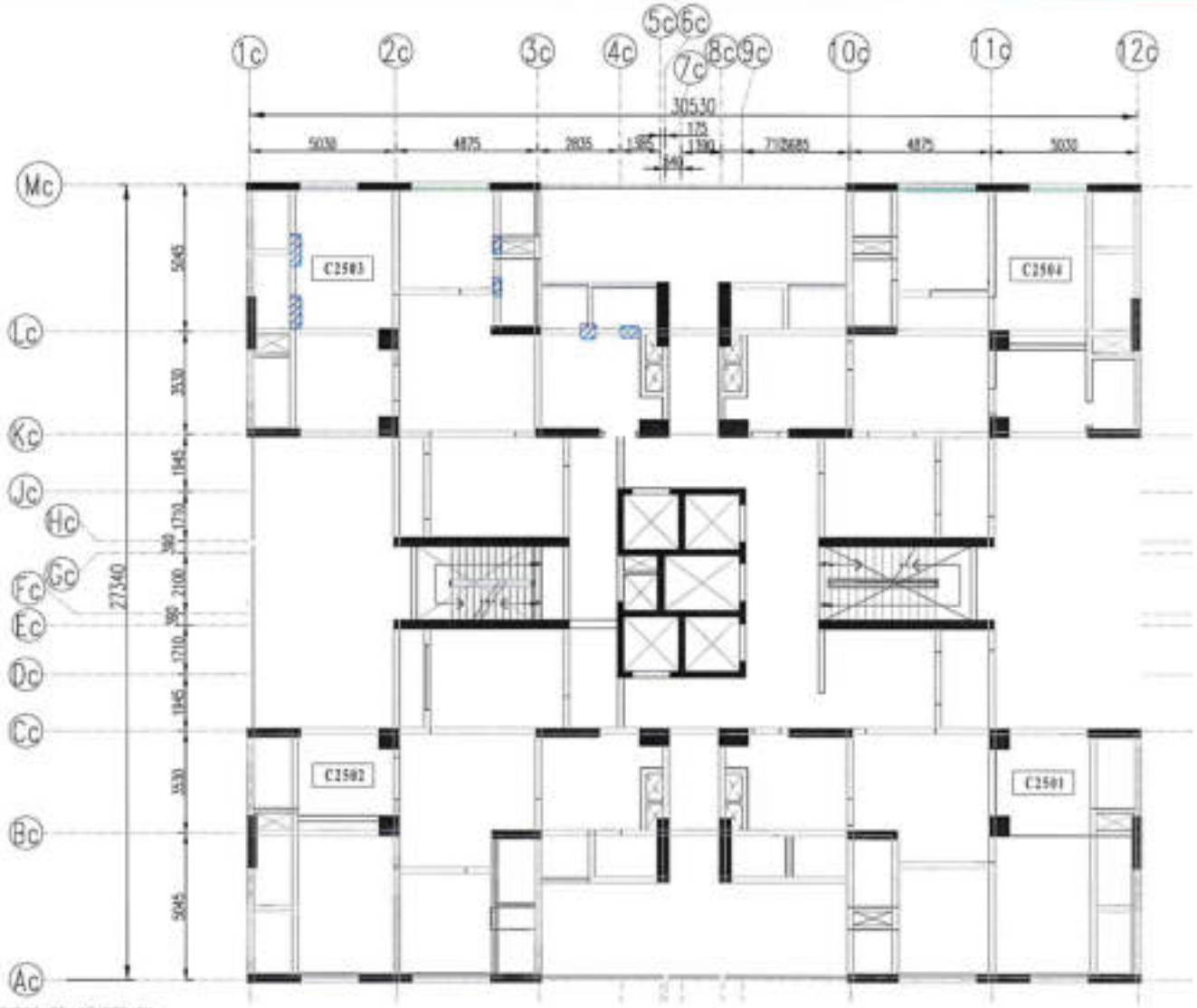

TOWER-C-TWENTY THIRD FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -23rd FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

| | | | |
|---|---|---|---|
| SCALE: NTS | DATE: 24-04-2023 | | |
| DWG. REF. No: CM/23F/TC-25 | REV.No. R0 | | |
| CONTRACT NO: 17671143 | | | |

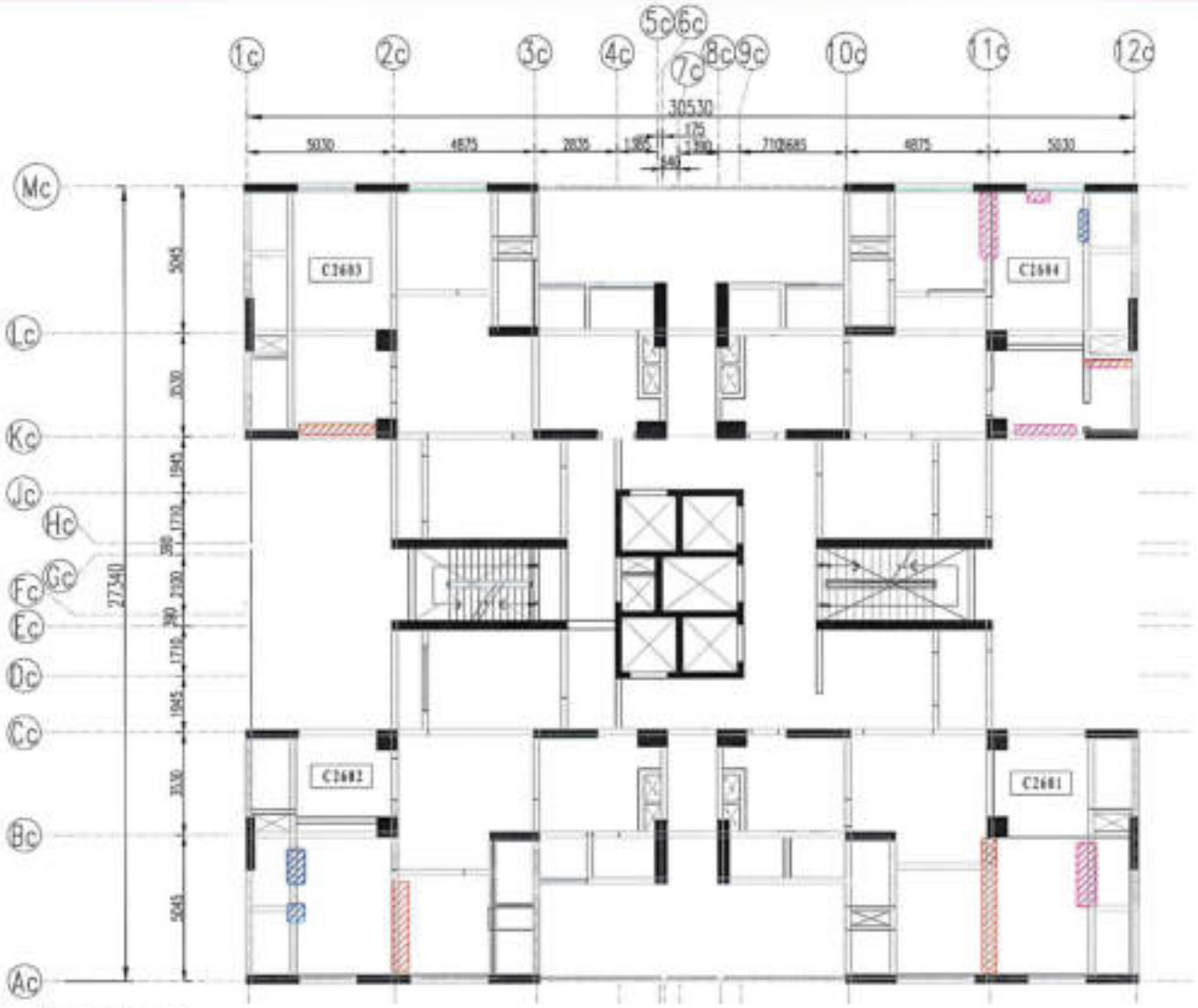



TOWER-C-TWENTY FIFTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTTILA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -25th FLOOR** | DRAWN: RISHI | CHECKED: CHR/MDS | SCALE: NTS | DATE: 24-04-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: DM/25F/TC-26 | REV.No: R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTTILA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




TOWER-C-TWENTY SIXTH FLOOR

LEGEND:

- PATCH UP WORKS DONE/ TREATED MEMBERS
- CORROSION CRACKS/ SPALLING OF COVER CONCRETE/ EXPOSURE OF REBARS
- DAMPNESS/ DAMP PATCHES / PEELING OF PAINT
- CRACKS IN FLOORING,MARBLE,GRANITE/ DEBOUND OF MARBLE,GRANITE CLADDING
- CRACKS IN MASONRY WALL/ SEPARATION CRACKS/ DEBOUND OF PLASTER
- CRACKS

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C -26th FLOOR** | DRAWN: RSKR | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

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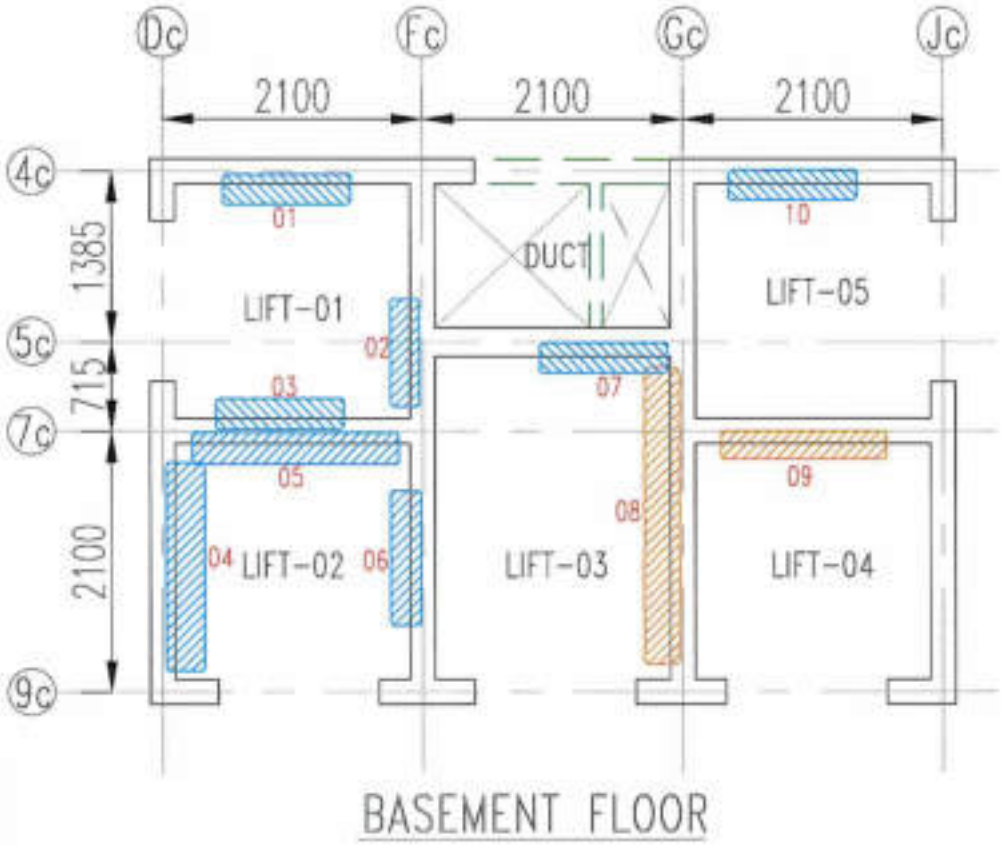
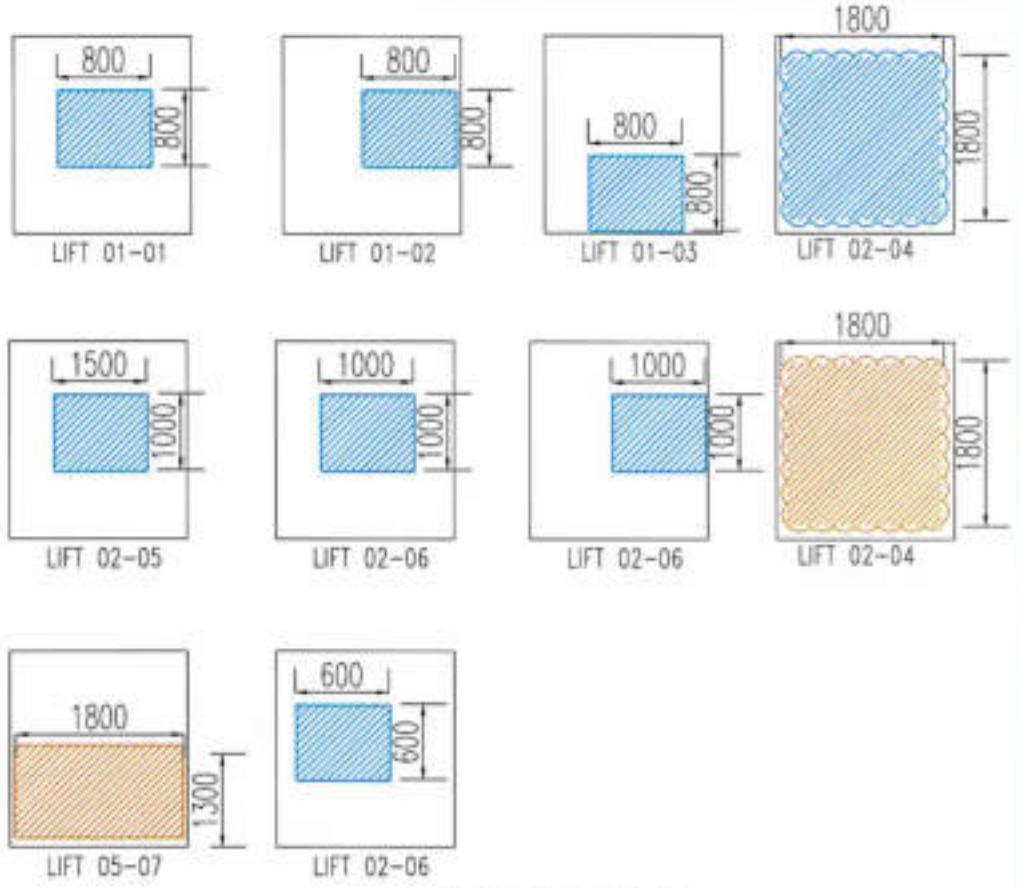
| SCALE: NTS | DATE: 29-09-2023 |
| DWG. REF. No: DM/26F/TC-27 | REV.No. R0 |
| CONTRACT NO: 17671143 | |




BASEMENT FLOOR

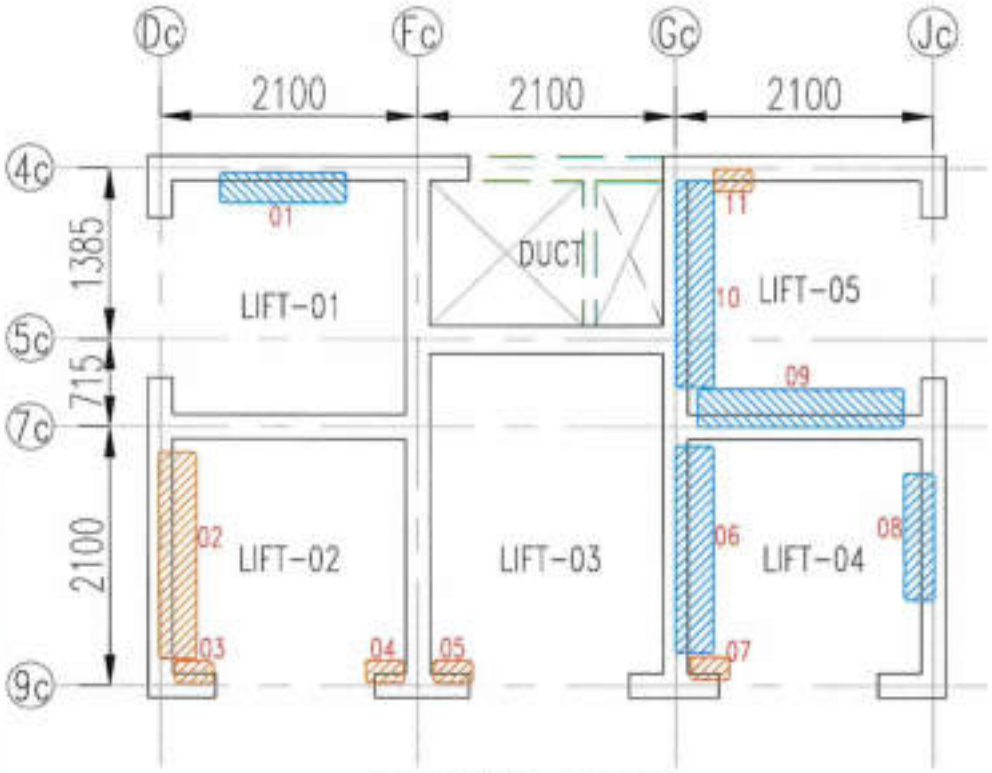



LIFT ELEVATIONS

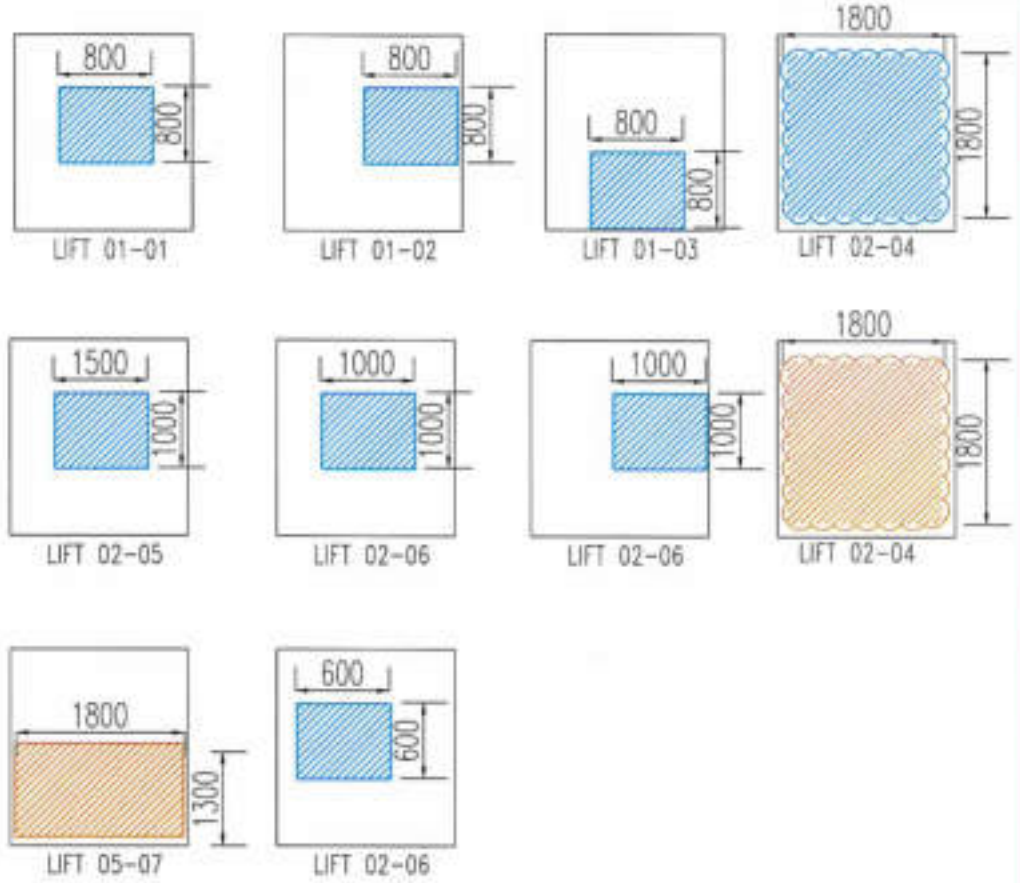
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - BASEMENT FLOOR** | DRAWN: RSKK; CHECKED: CHR/MBS; APPROVED: AJ/Dr.KS | SCALE: NTS; DATE: 24-08-2022; DWG. REF. No : BN/LN/BF/TC-01; REV.No. R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |




GROUND FLOOR

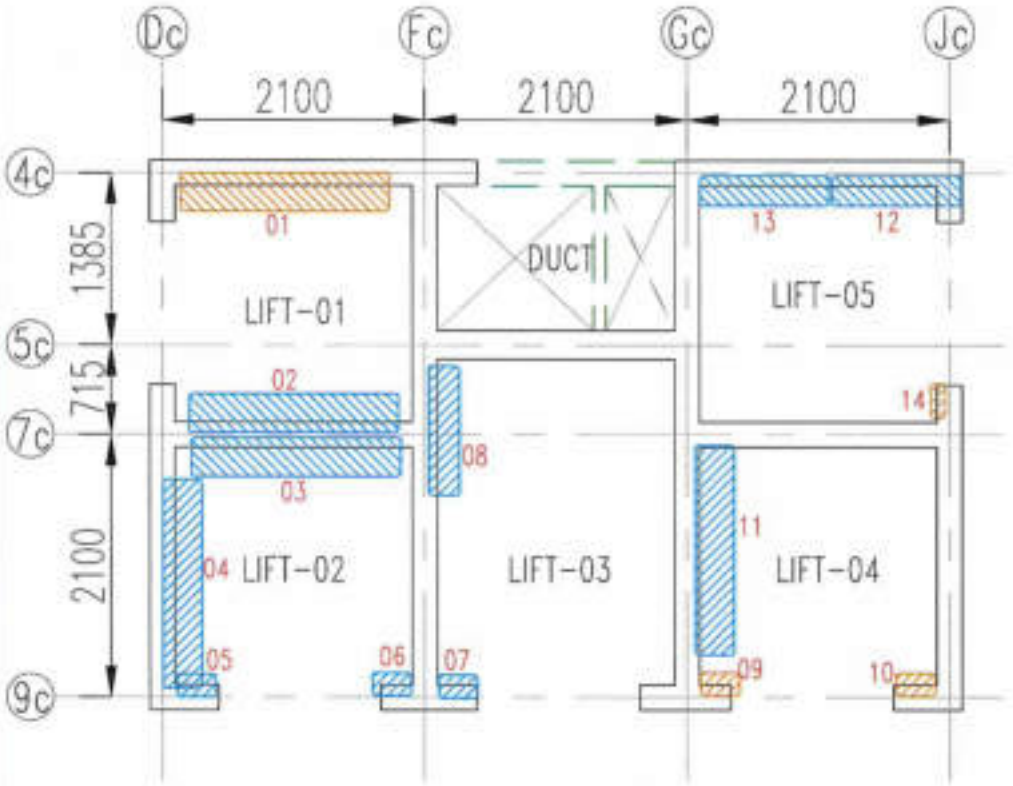



LIFT ELEVATIONS

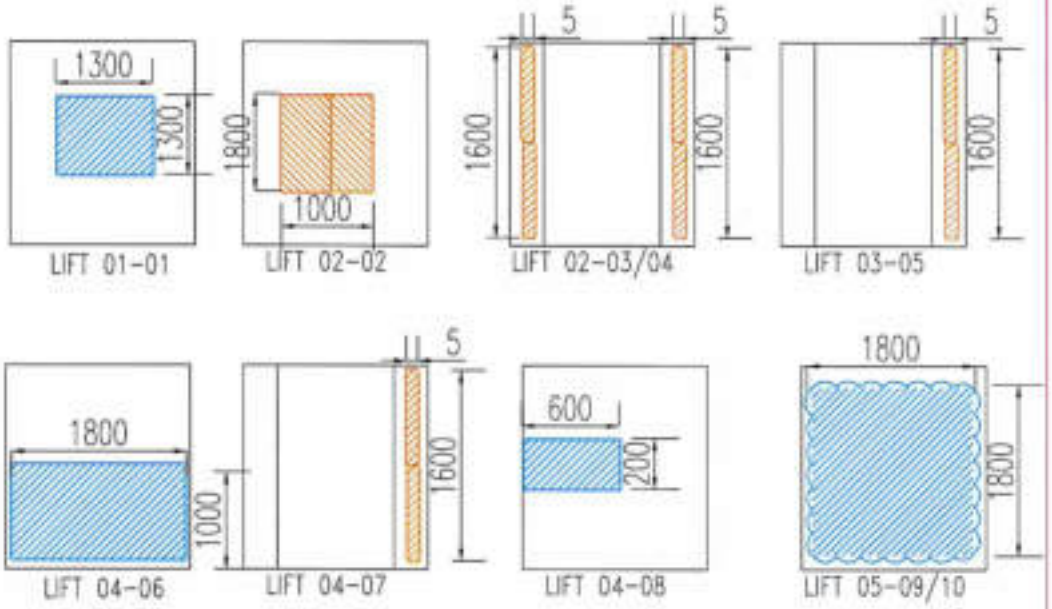
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - GROUND FLOOR** | DRAWN: RSKK | CHECKED: CHR/MRS | SCALE: NTS | DATE: 24-08-2023 |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : BW/LW/DF/TC-02 | REV.No. R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




1st FLOOR

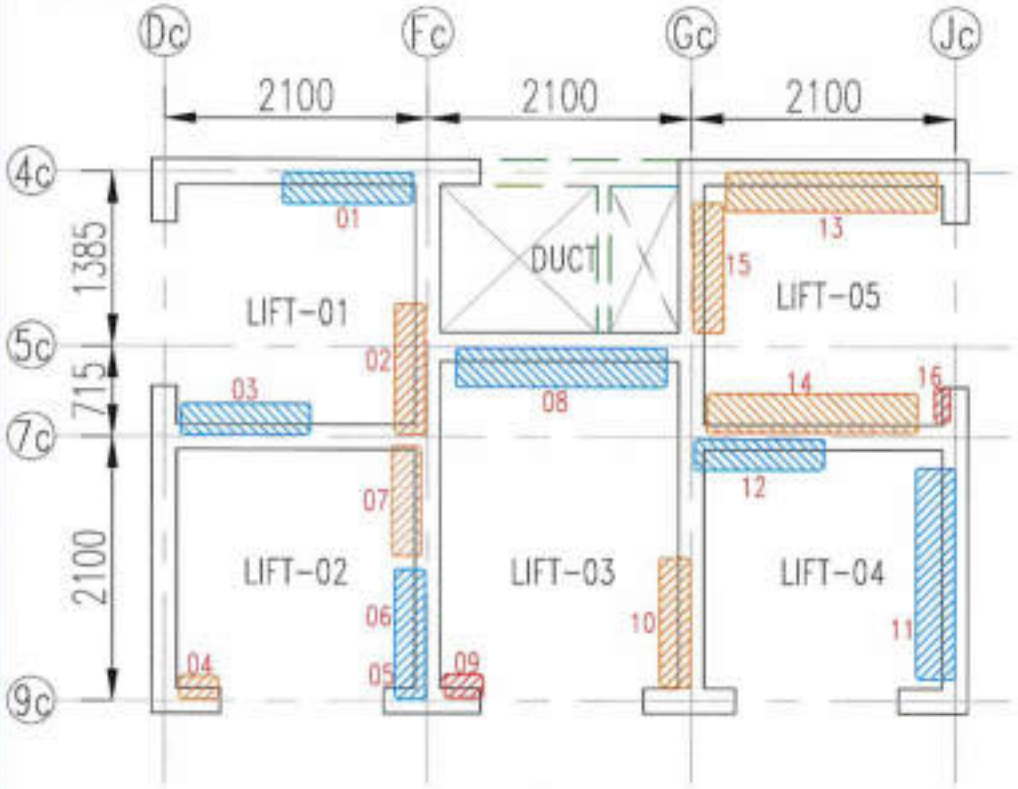



LIFT ELEVATIONS

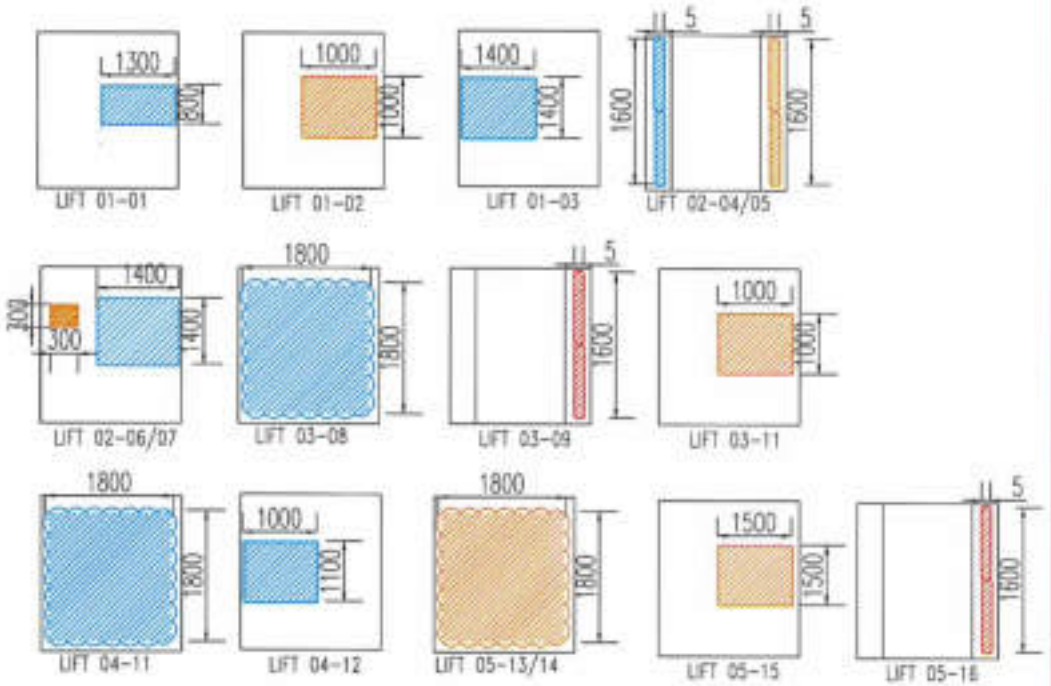
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 1ST FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SELVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2013 |
| | | DWG. REF. No : DW/LW/1F/TC-03 | REV.No: R0 |
| | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 | |




2nd FLOOR



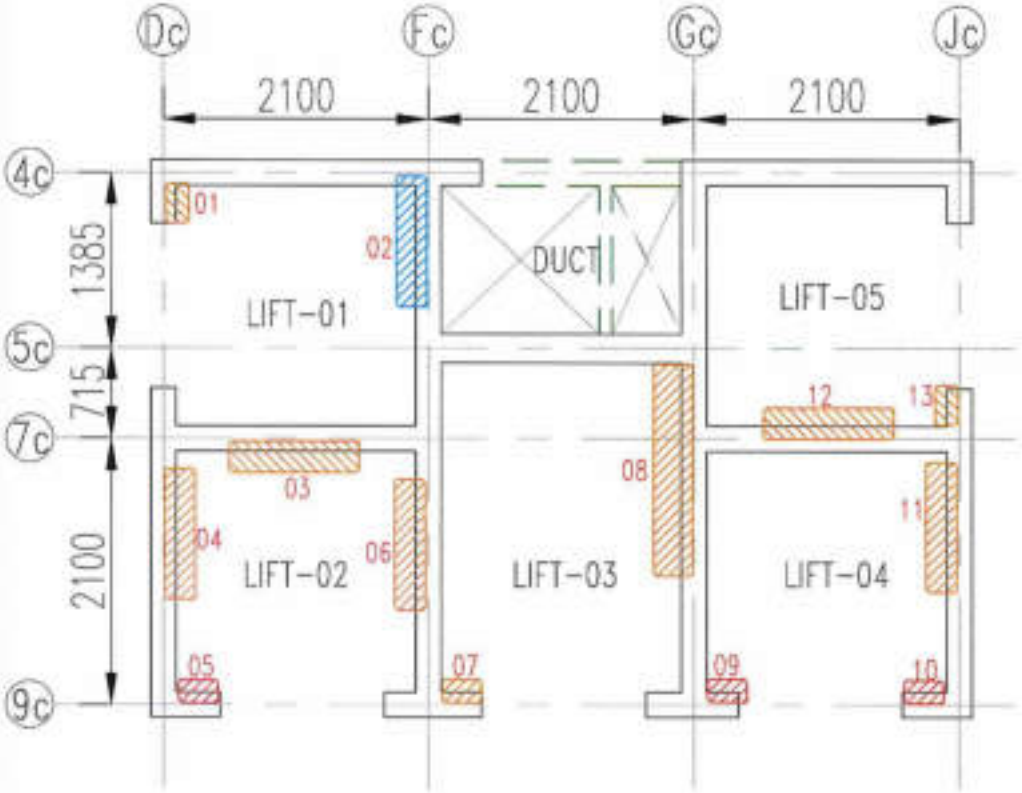

LIFT ELEVATIONS

**LEGEND:**

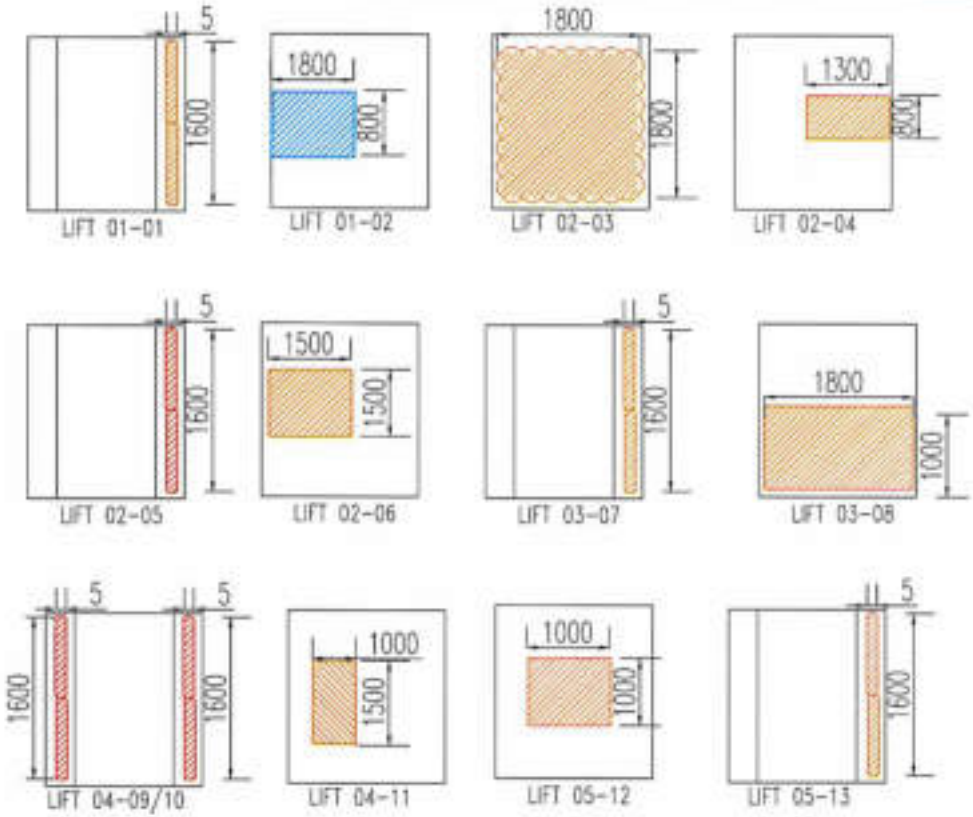
- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 2nd FLOOR** | DRAWN: RSHK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

| | | | |
|---|---|---|---|
| SCALE: NTS | DATE: 24-04-2023 | | |
| DWG. REF. No : BM/LW/DF/TC-04 | REV.No. R0 | | |
| CONTRACT NO: 17671143 | | | |




3rd FLOOR




LIFT ELEVATIONS

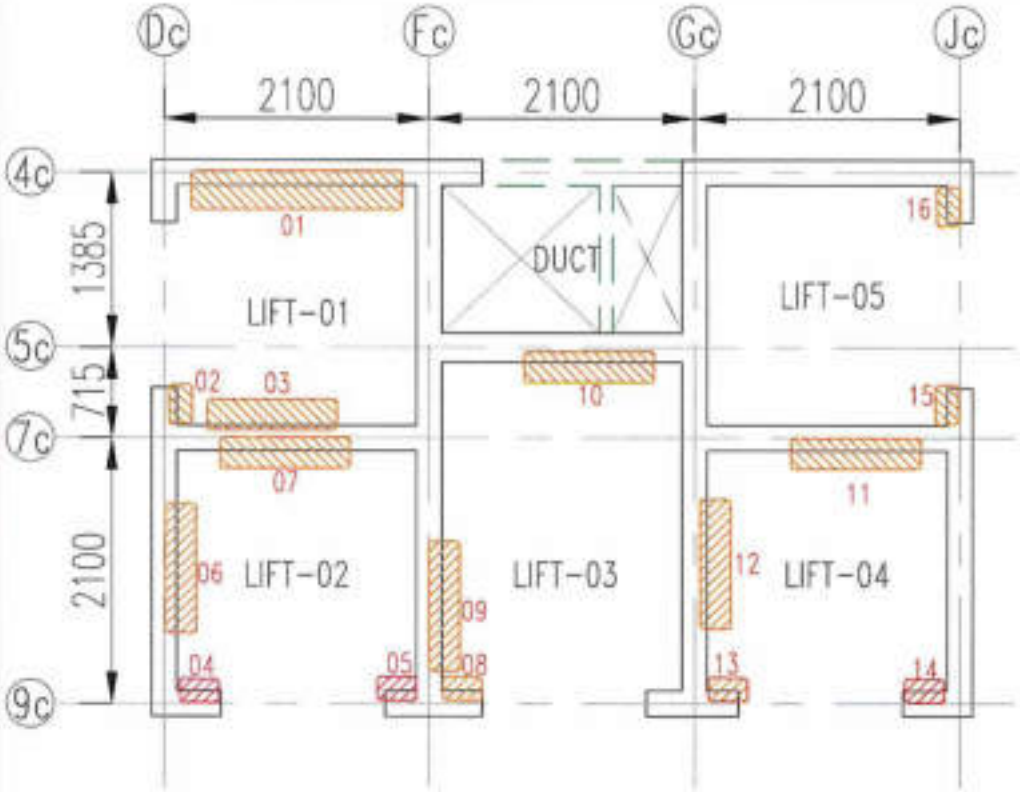
**LEGEND:**

MINOR CORROSION CRACKS AND DEBOUNDED PLASTER

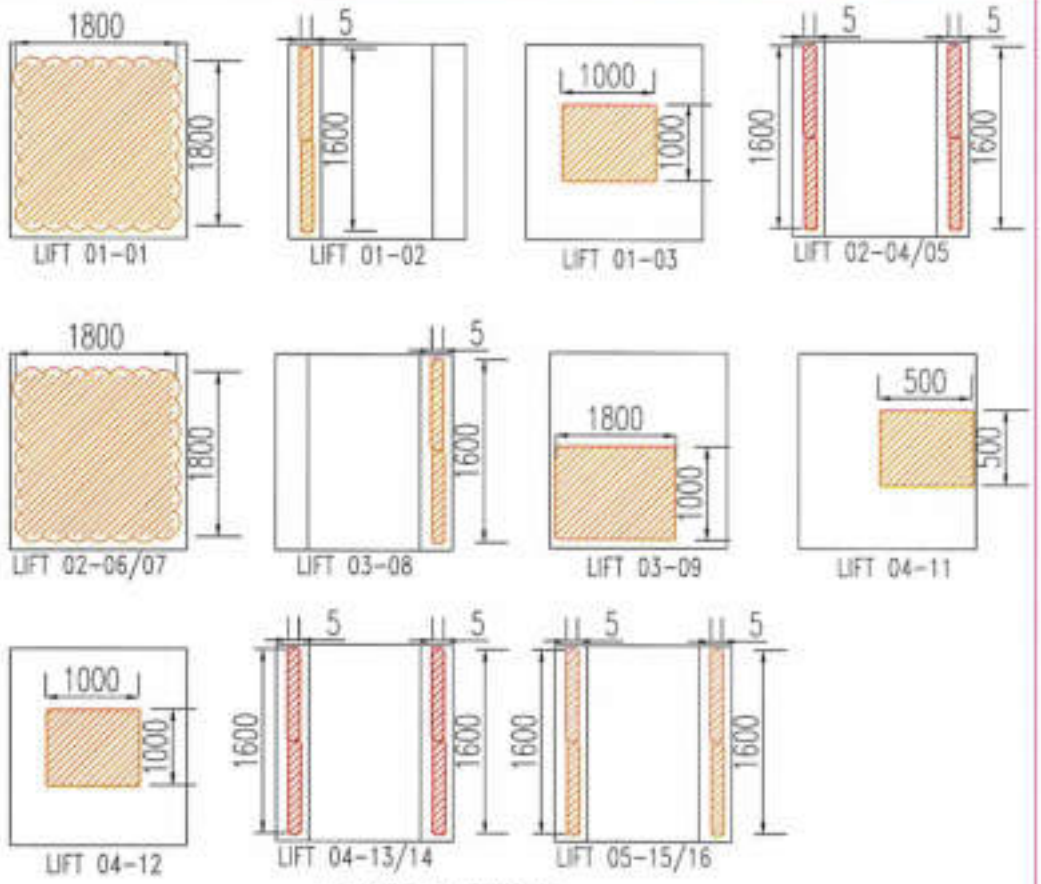
MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER

MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 3rd FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No: GM/LW/SF/TC-05 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 |




4th FLOOR

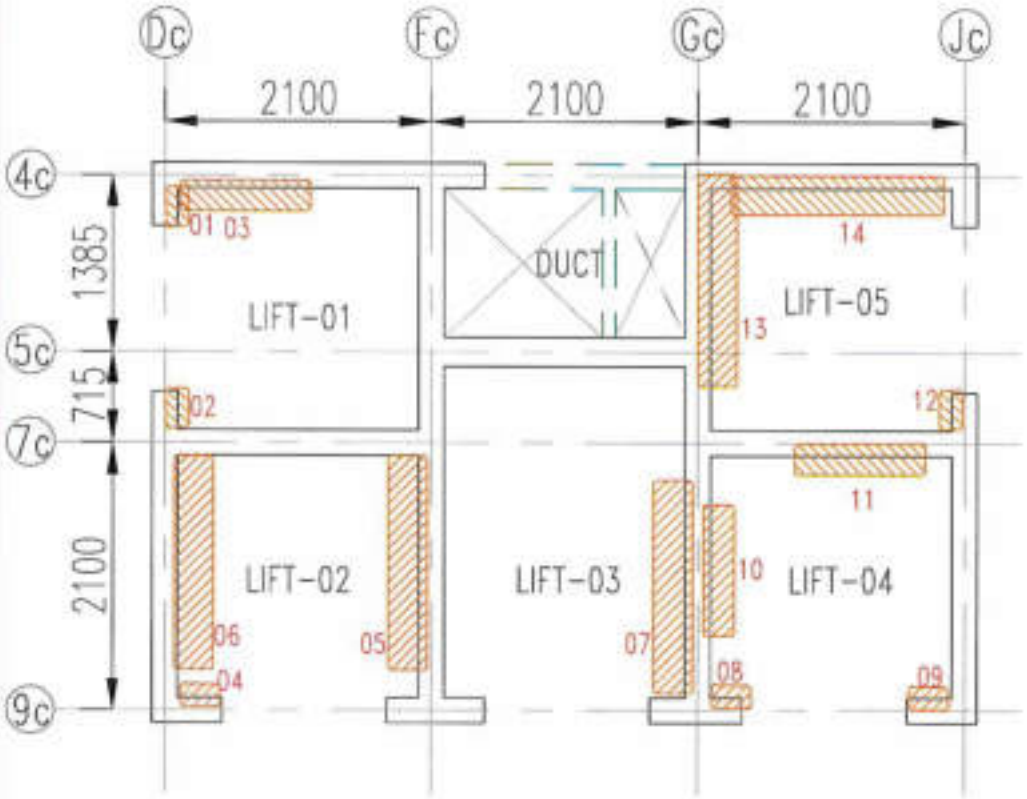



LIFT ELEVATIONS

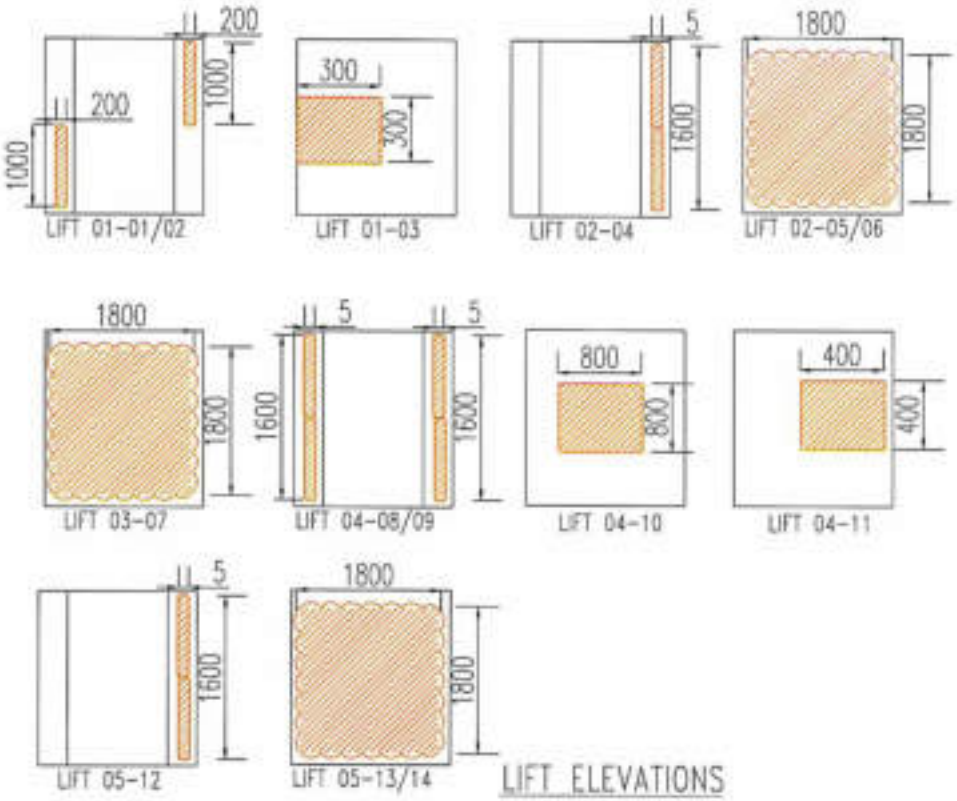
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 4th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. NO.: DM/LN/AF/TC-08 | REV.No. R0 |
| CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




5th FLOOR




LIFT ELEVATIONS

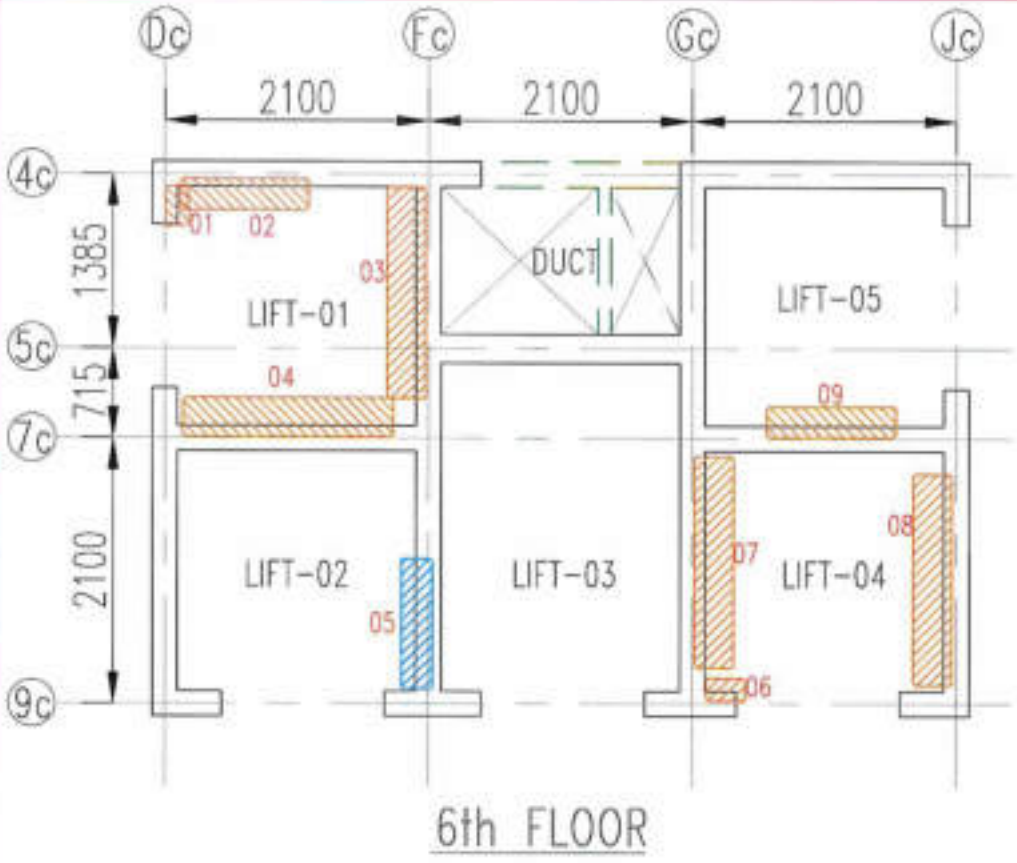
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

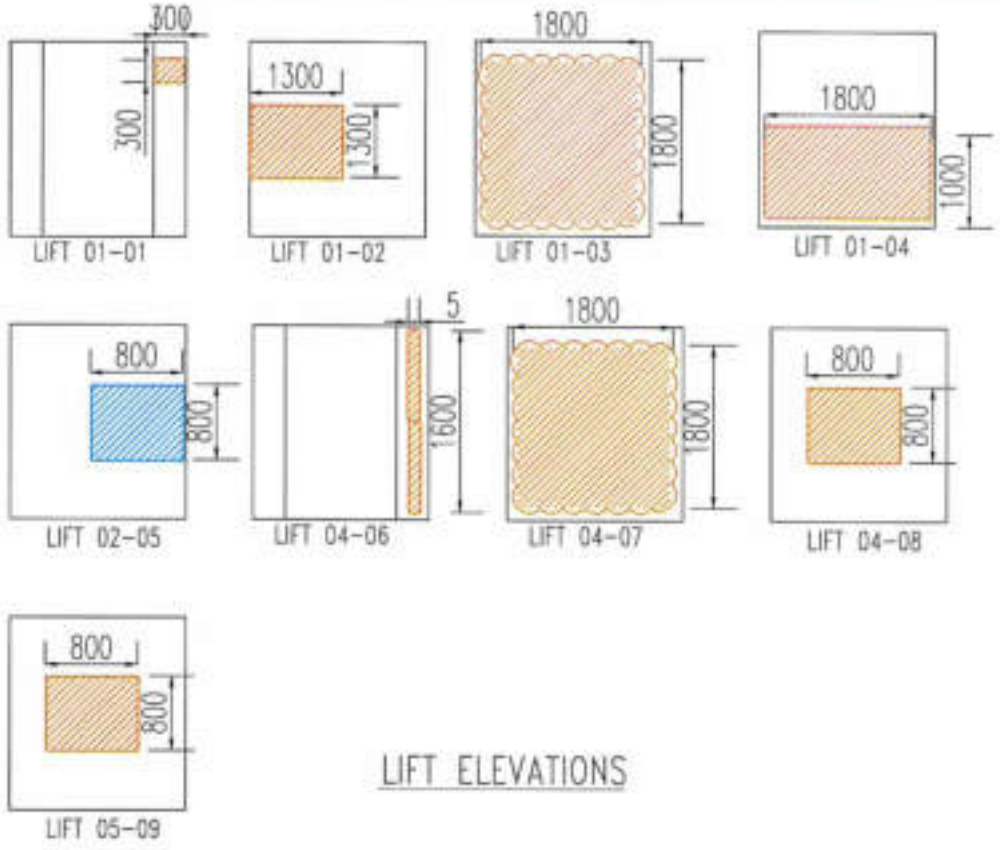
| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTTILA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 5th FLOOR** | DRAWN: RSHK | CHECKED: CHR/MBS | SCALE: NTS |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : BA/LW/SF/TC-07 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTTILA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 |

DATE: 24-08-2023

REV.No: R0




6th FLOOR



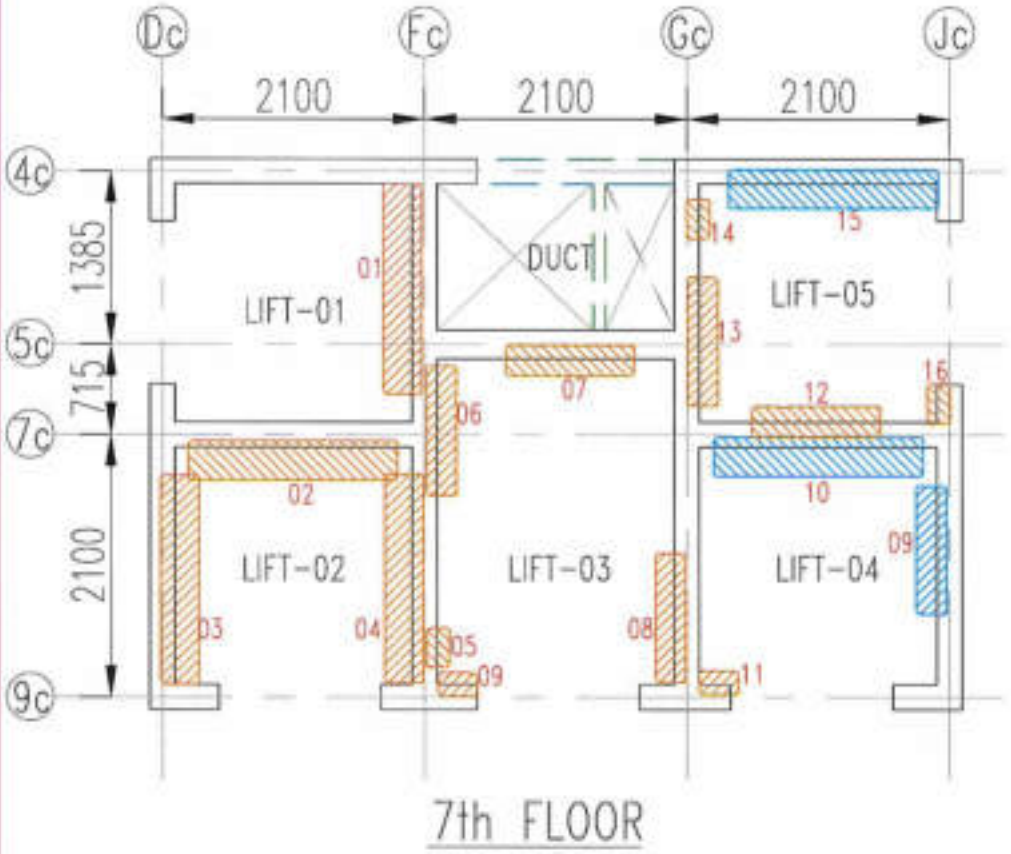

LIFT ELEVATIONS

**LEGEND:**

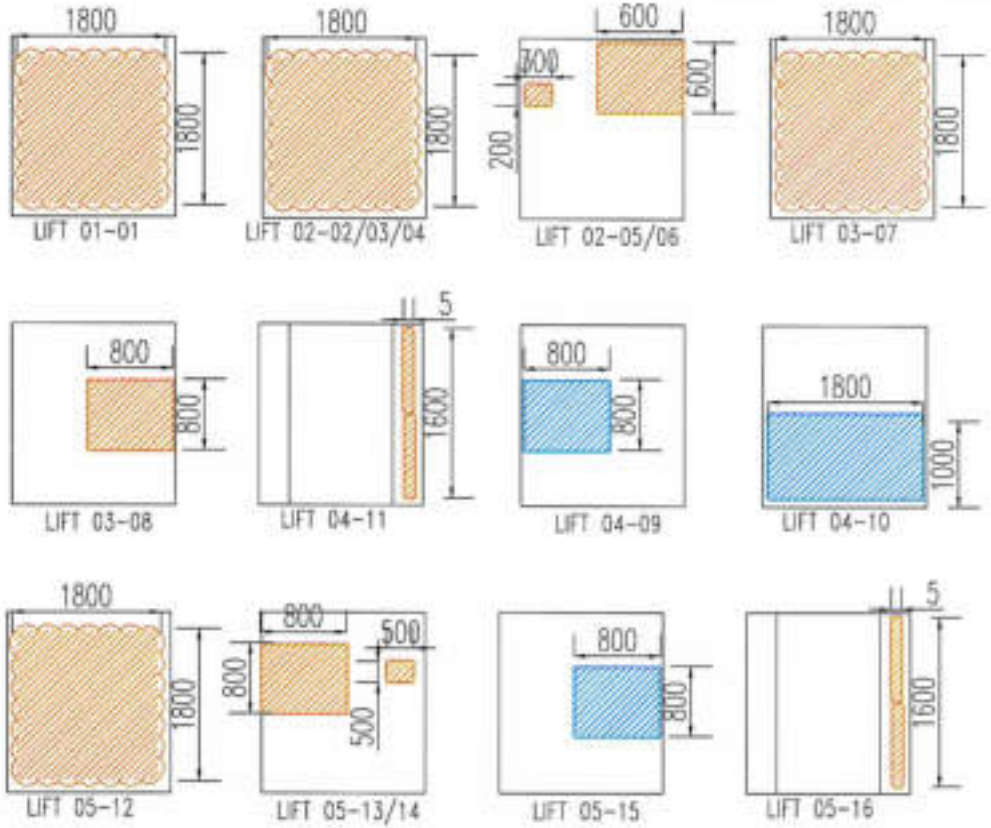
- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 6th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | |

| | | | |
|---|---|---|---|
| SCALE: NTS | DATE: 21-04-2022 | | |
| DRG. REF. No : DM/LM/BF/TC-08 | REV.No: R0 | | |
| CONTRACT NO: 17671143 | | | |




7th FLOOR




LIFT ELEVATIONS

**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 7th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | APPROVED: AJ/Dr.KS | SCALE: NTS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | DATE: 24-04-2023 |
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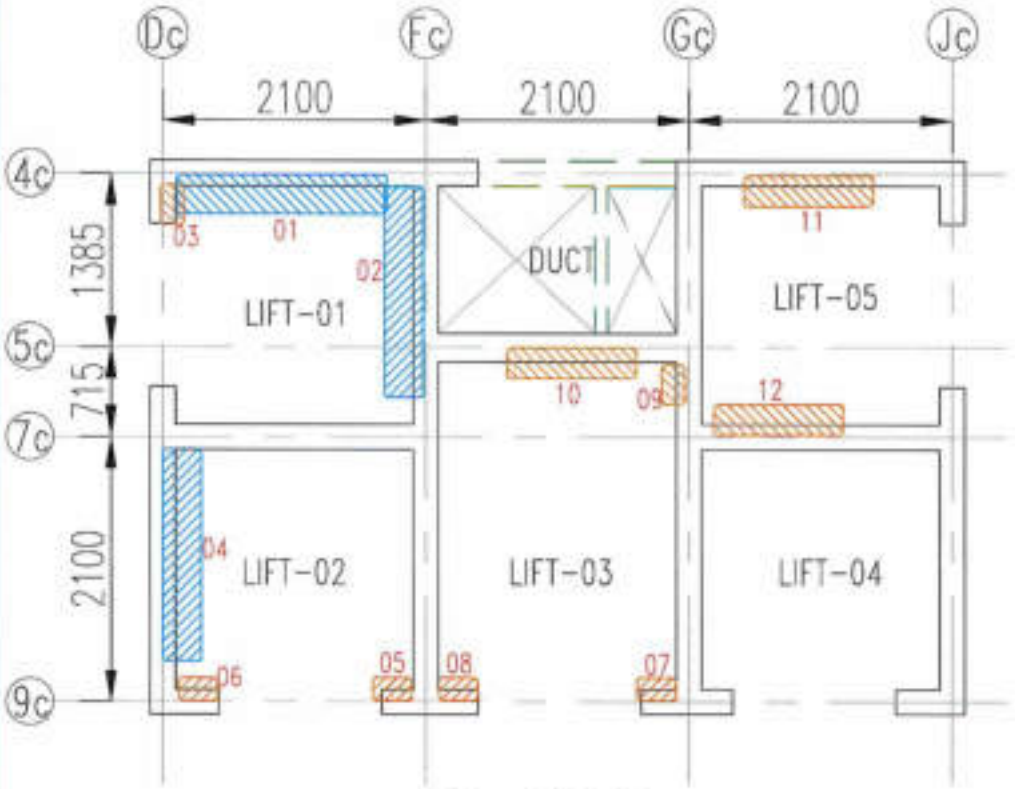
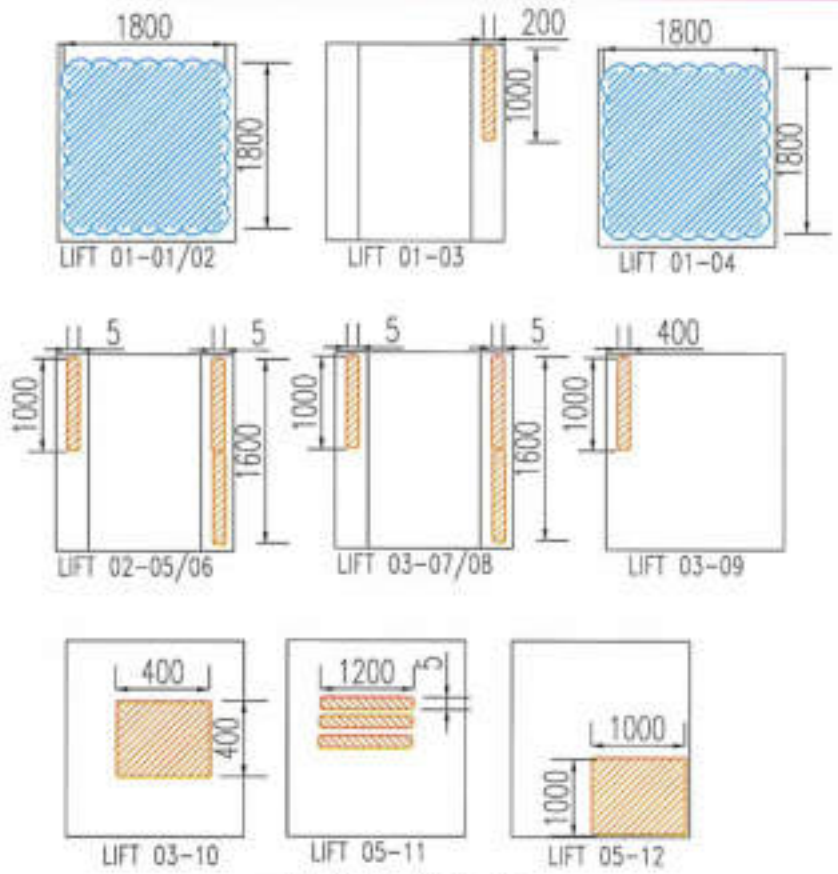
| | | CONTRACT NO: 17671143 | |




8th FLOOR

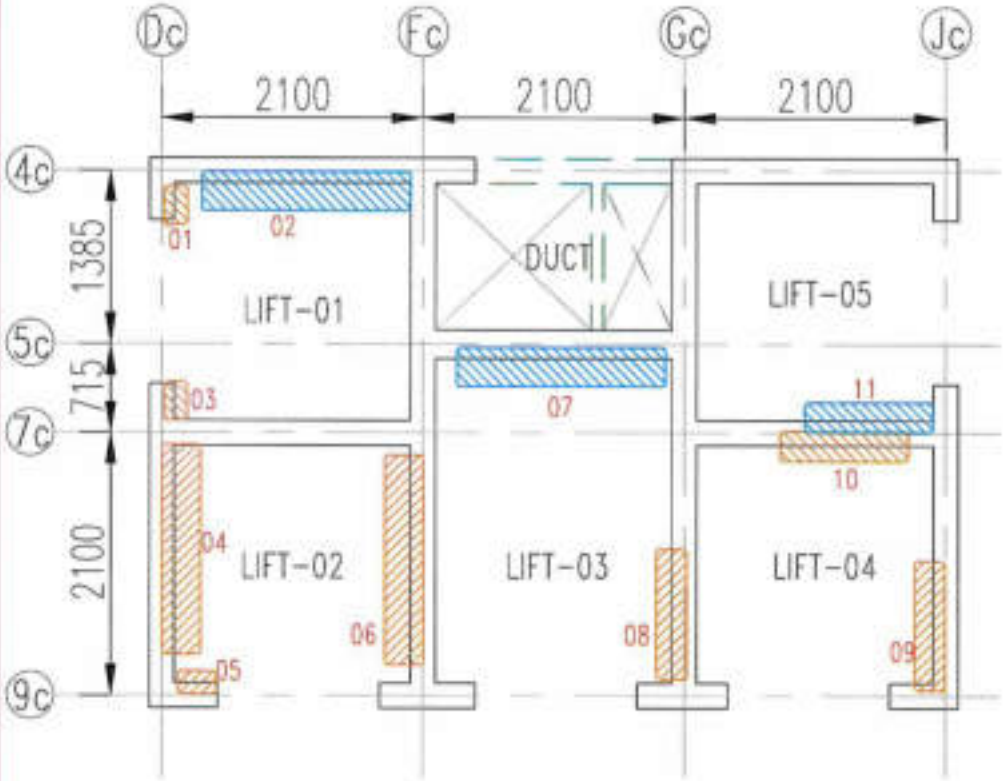



LIFT ELEVATIONS

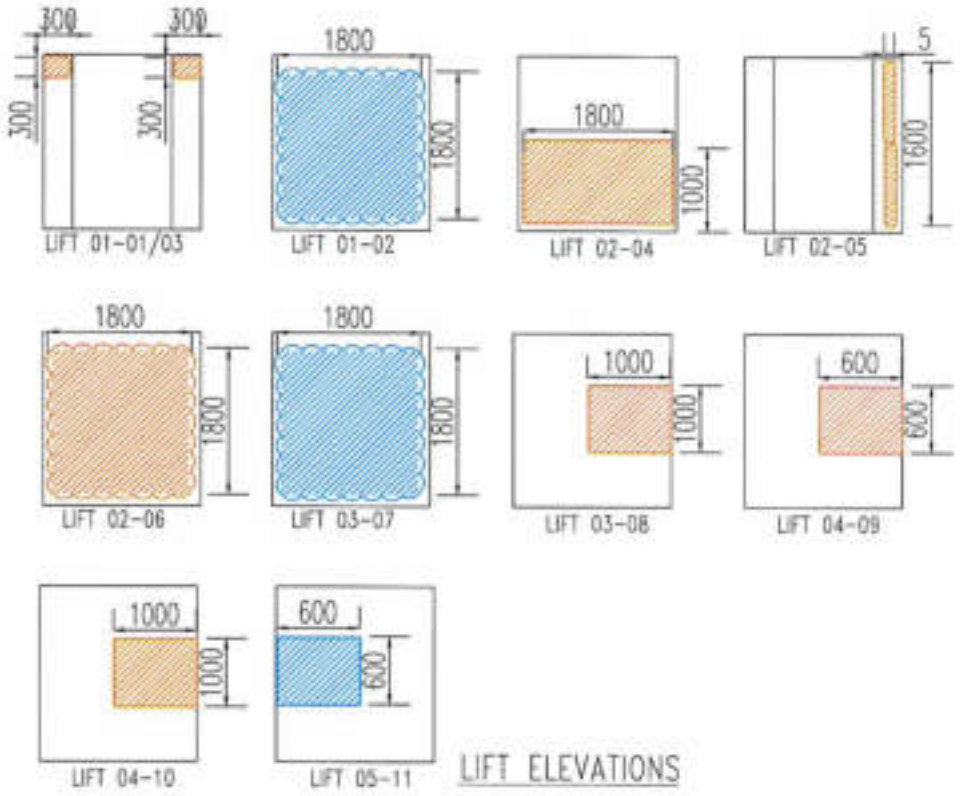
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 8th FLOOR** | DRAWN: RSHK; CHECKED: CHR/MBS; APPROVED: AJ/Dr.KS | SCALE: NTS; DATE: 24-04-2023; DWG. REF. No : DN/LN/ST/TC-10; REV.No: R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERSUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |




9th FLOOR




LIFT ELEVATIONS

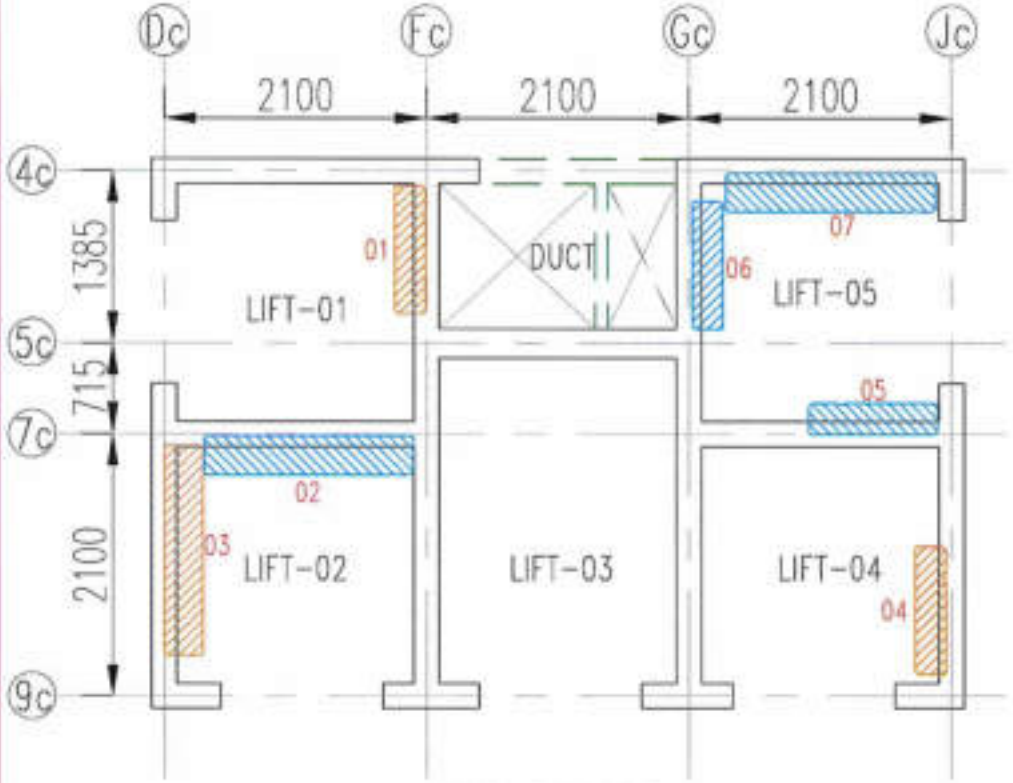
**LEGEND:**

MINOR CORROSION CRACKS AND DEBOUNDED PLASTER

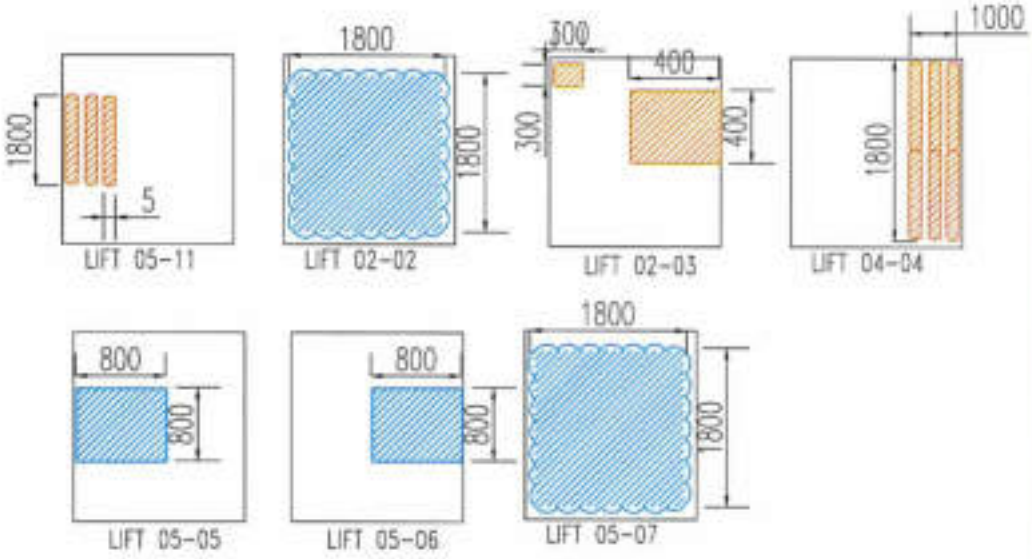
MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER

MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 9th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS |
| | | | APPROVED: AJ/Dr.KS | DWG. REF. No : BM/LN/9F/TC-11 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDRIKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 |




10th FLOOR

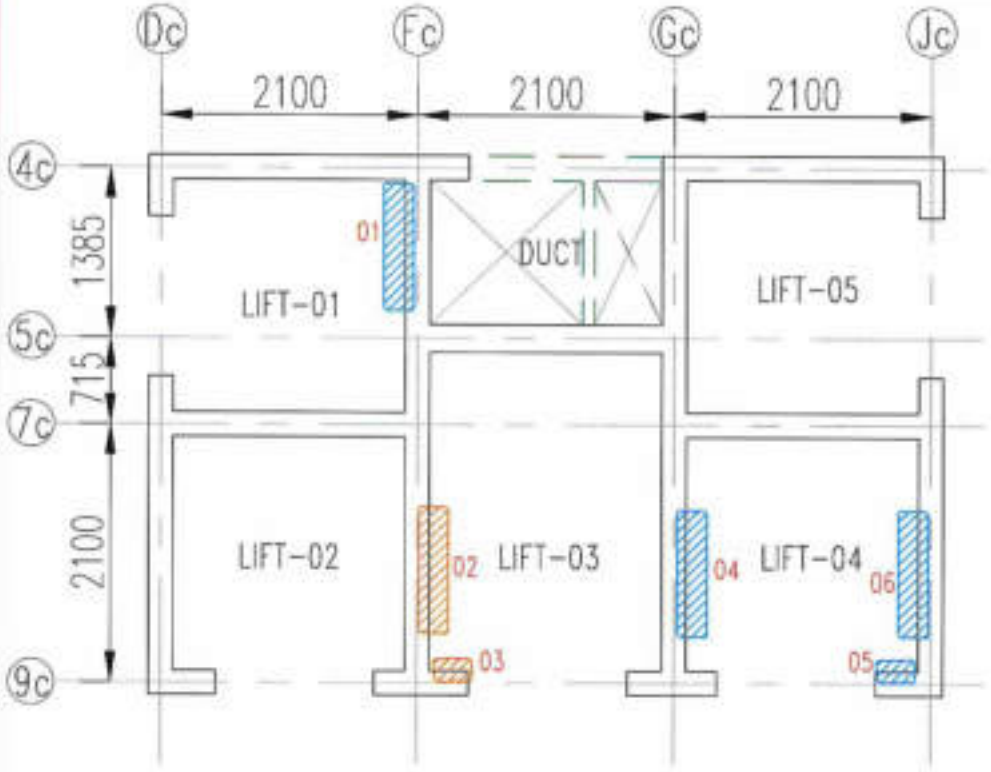



LIFT ELEVATIONS

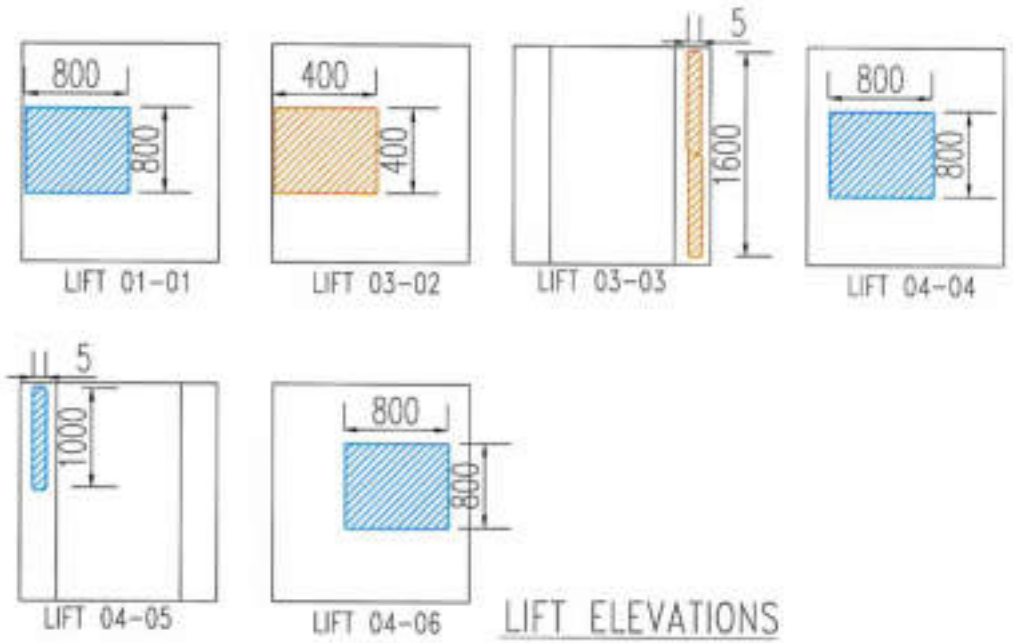
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 10th FLOOR** | DRAWN: RSKK / CHECKED: CHR/MBS / APPROVED: AJ/Dr.KS | SCALE: NTS / DATE: 24-04-2023 / DWG. REF. No : BW/LW/10F/TC-12 / REV.No. R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |




11th FLOOR

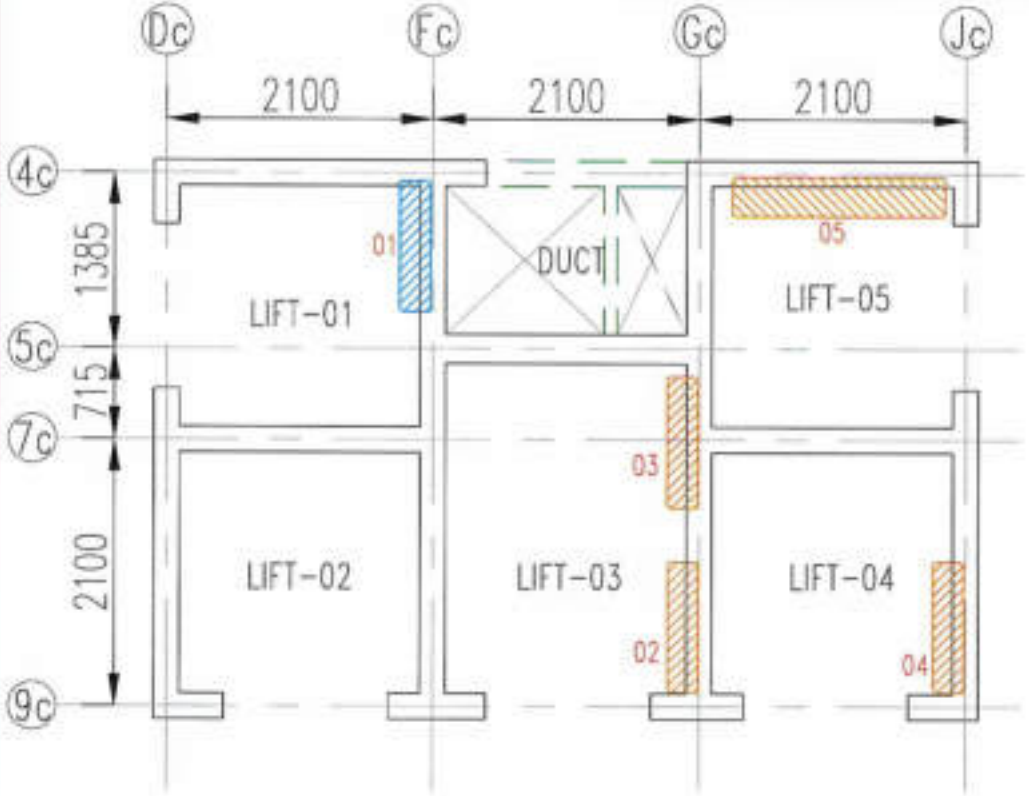



LIFT ELEVATIONS

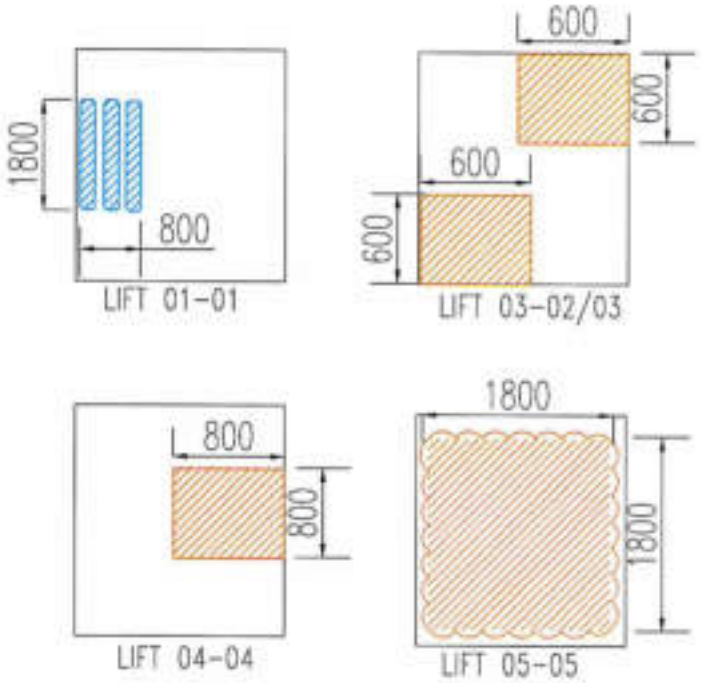
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 11th FLOOR** | DRAWN: RSKK; CHECKED: CHR/MBS; APPROVED: AJ/Dr.KS | SCALE: NTS; DATE: 24-04-2023; DWG. REF. No : DM/LW/117/TC-13; REV.No. R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |




12th FLOOR

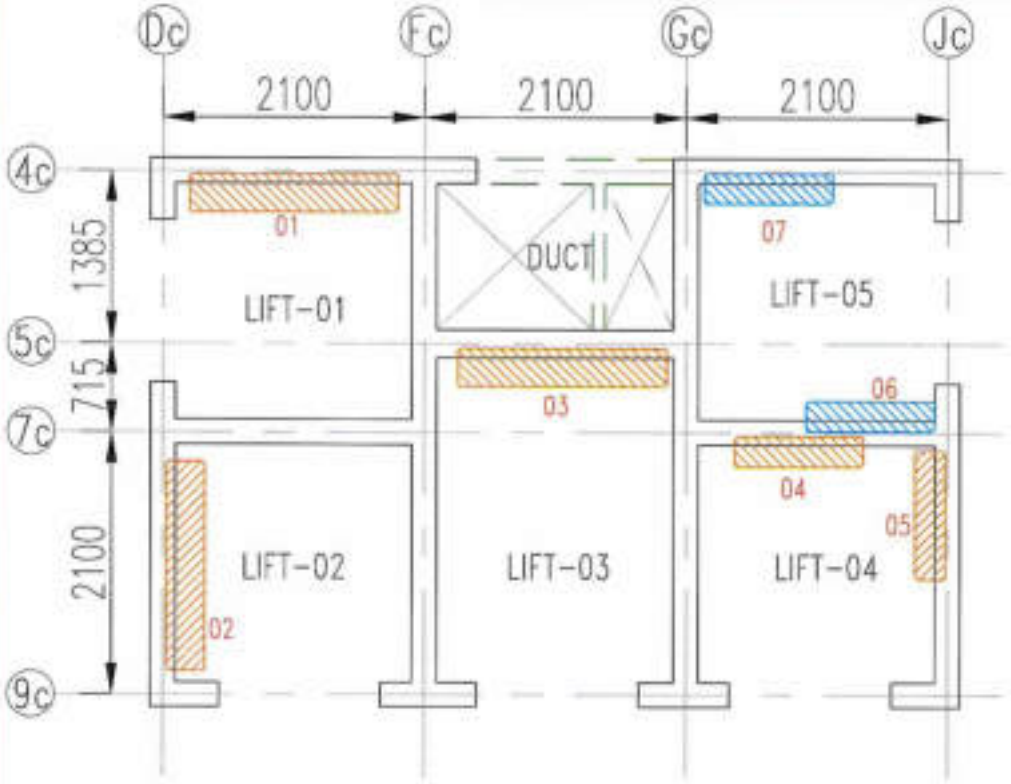



LIFT ELEVATIONS

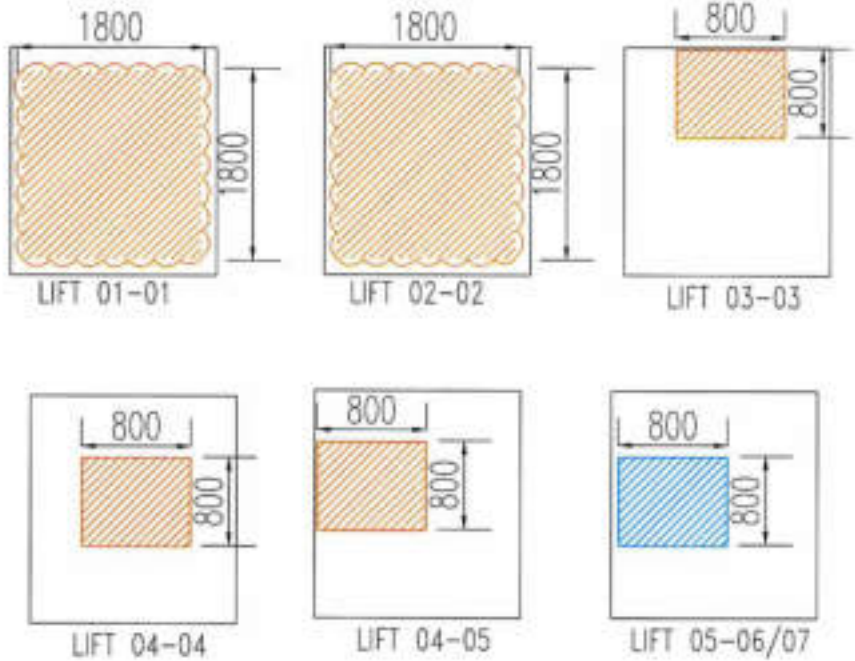
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 12th FLOOR** | DRAWN: RSKK | CHECKED: CHM/MBS | SCALE: NTS |
| | | | APPROVED: AJ/Dr.HS | DATE: 24-04-2023 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT – TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | DWG. REF. No : CM/LW/137/TC-14 REV.No. R0 |
| | | | | CONTRACT NO: 17671143 |




13th FLOOR

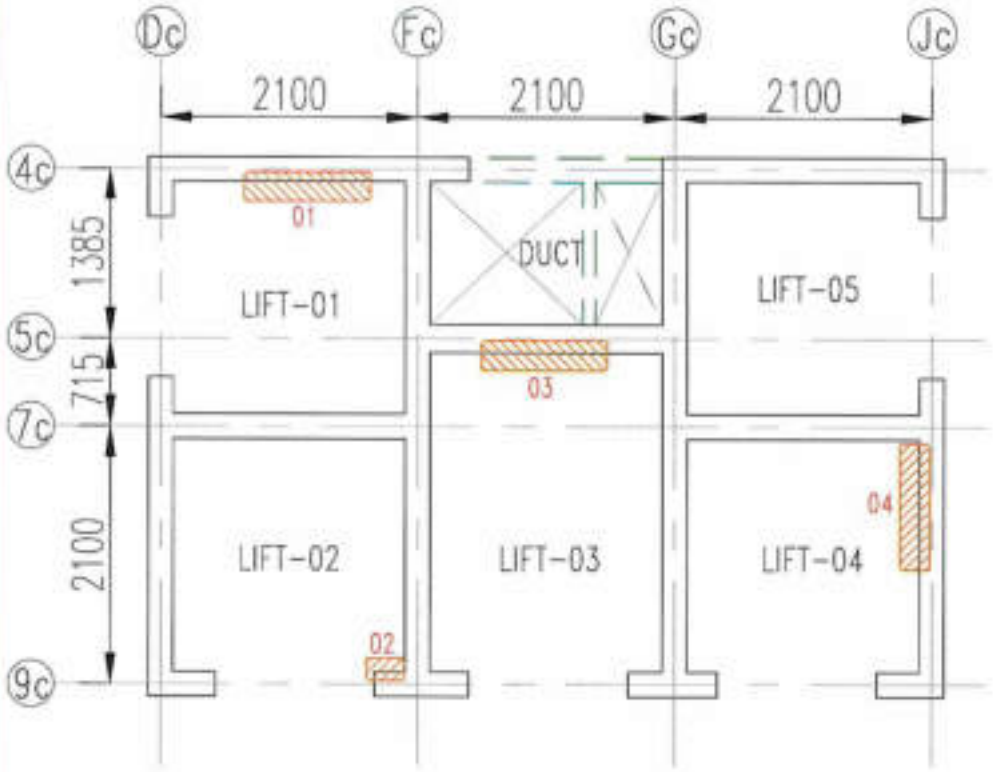



LIFT ELEVATIONS

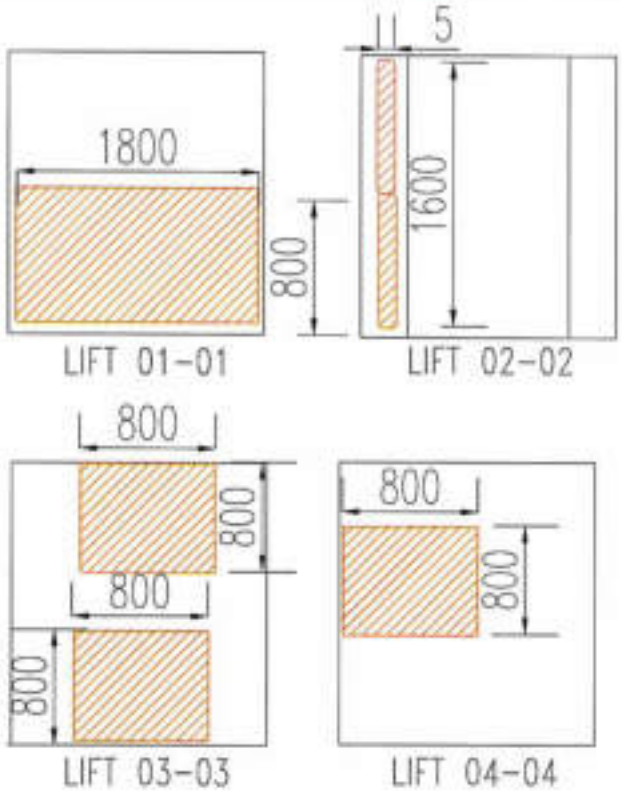
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 13th FLOOR** | DRAWN: MS/KK CHECKED: CHR/MBS APPROVED: AJ/Dr.HS | SCALE: NTS DATE: 24-04-2023 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | DWG. REF. No: DM/LM/LIF/TC-15 REV.No: R0 |
| | | | CONTRACT NO: 17671143 |




14th FLOOR

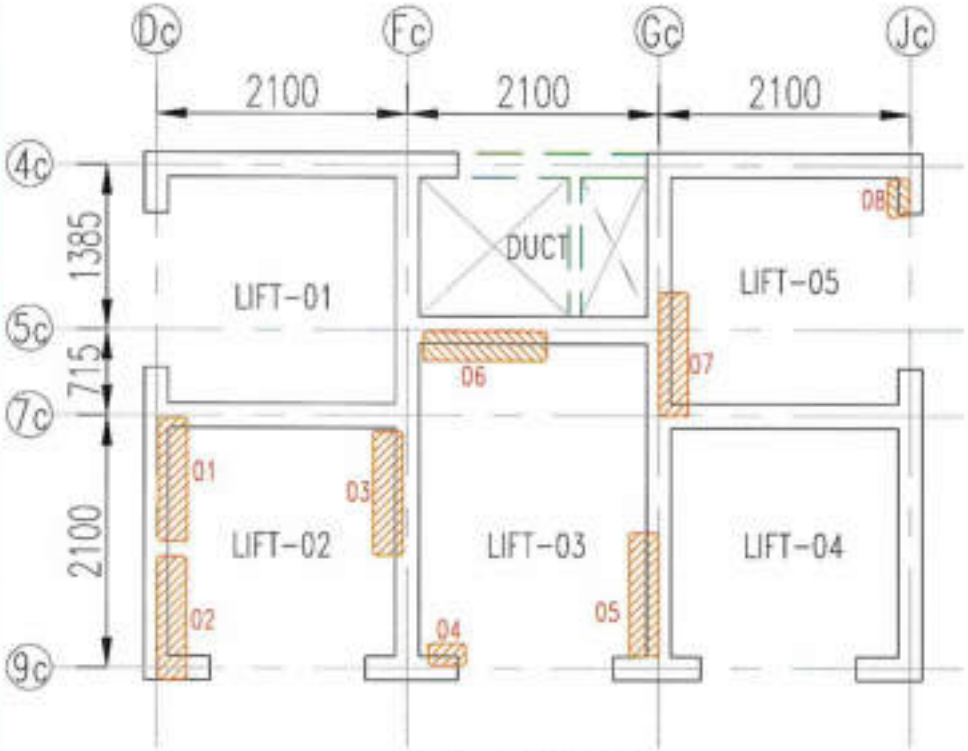



LIFT ELEVATIONS

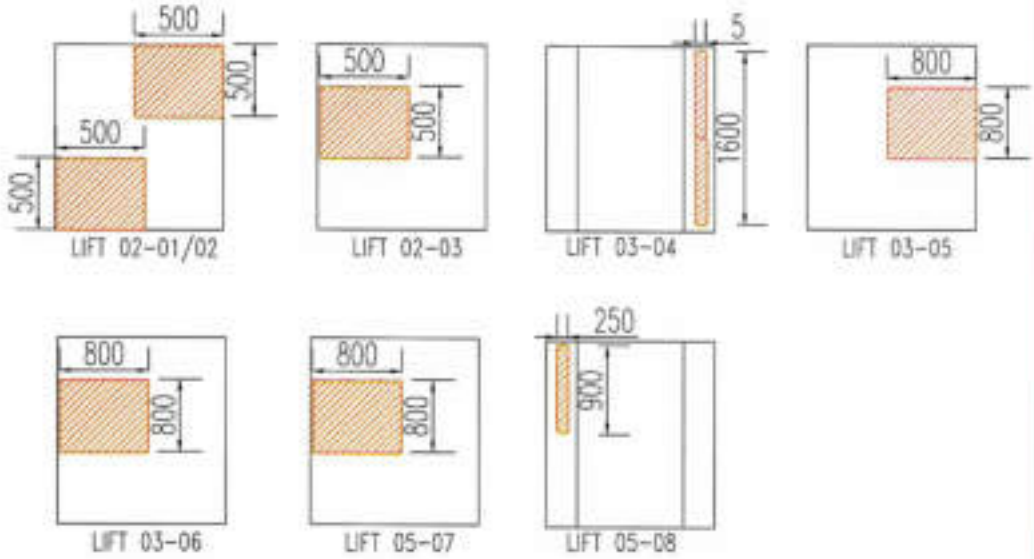
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 14th FLOOR** | DRAWN: RSHK | CHECKED: CHR/MSS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-OK-2023 |
| | | DWG. REF. No: CW/18/14F/TC-16 | REV.No: R0 |
| | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 | |




15th FLOOR

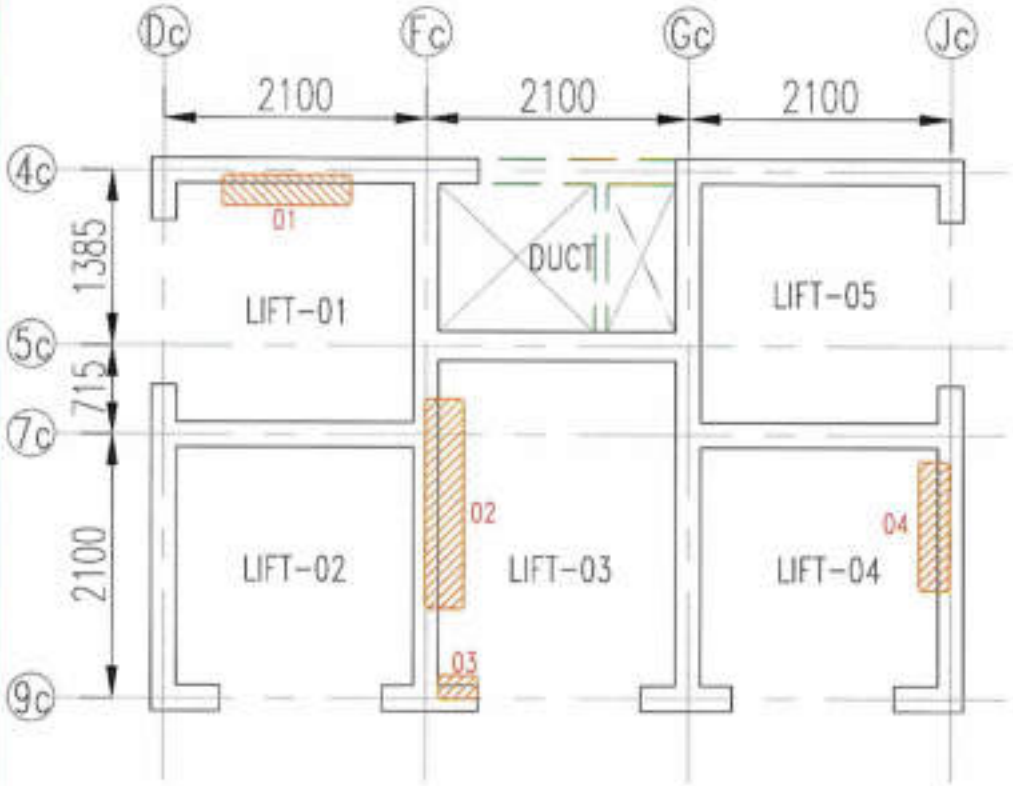



LIFT ELEVATIONS

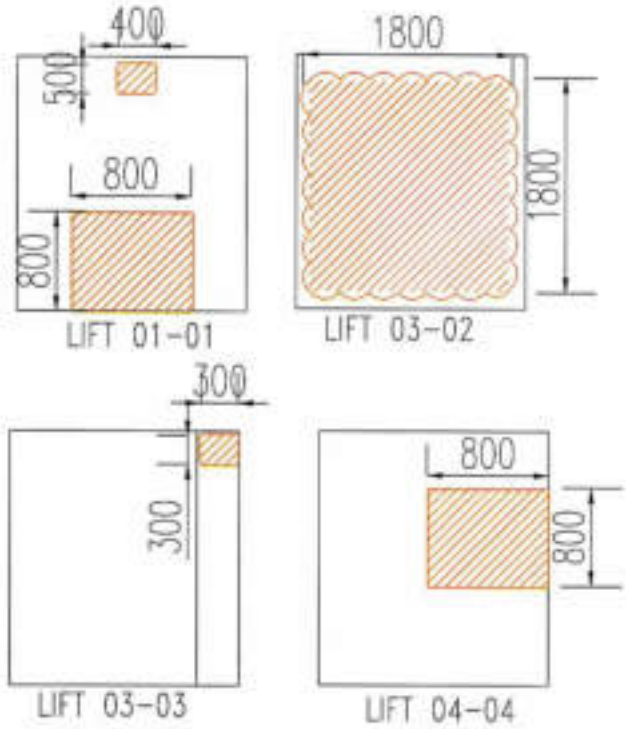
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 15th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. REF. No : DW/LW/15F/TC-17 | REV.No: R0 |
| | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 | |




16th FLOOR

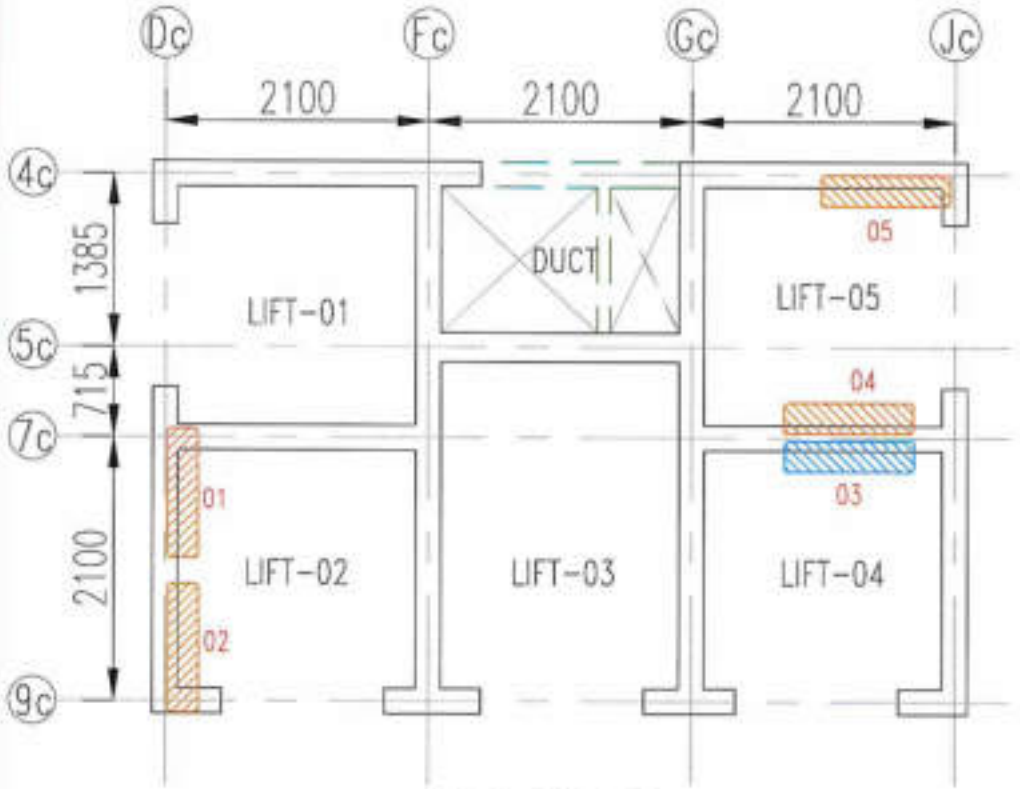



LIFT ELEVATIONS

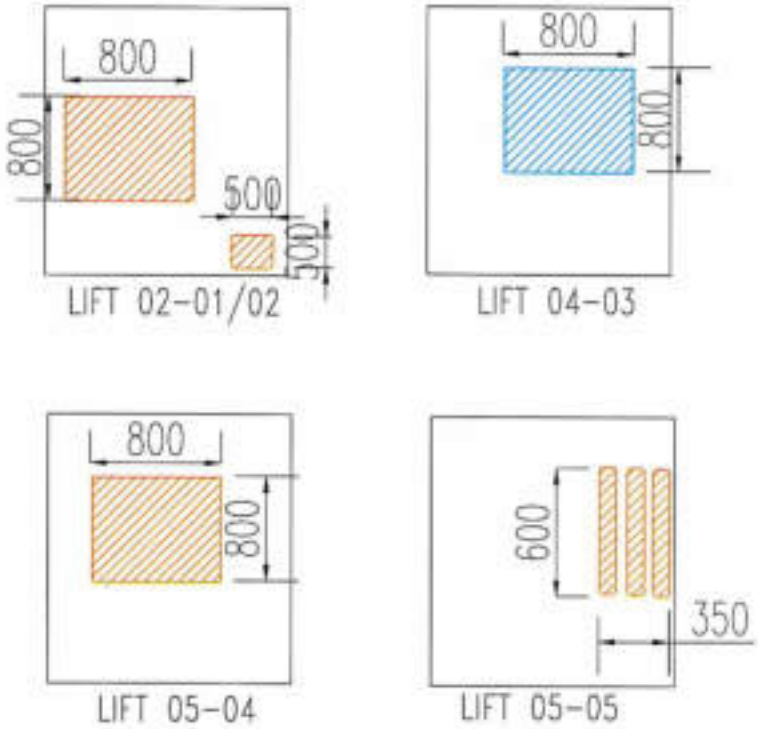
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 16th FLOOR** | DRAWN: RISHI | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | SCALE: NTS |
| | | | DATE: 24-04-2023 |
| | | | DWG. REF. No: -DM/LM/16F/TC-18 |
| | | | REV.No: R0 |
| | | | CONTRACT NO: 17671143 |




17th FLOOR

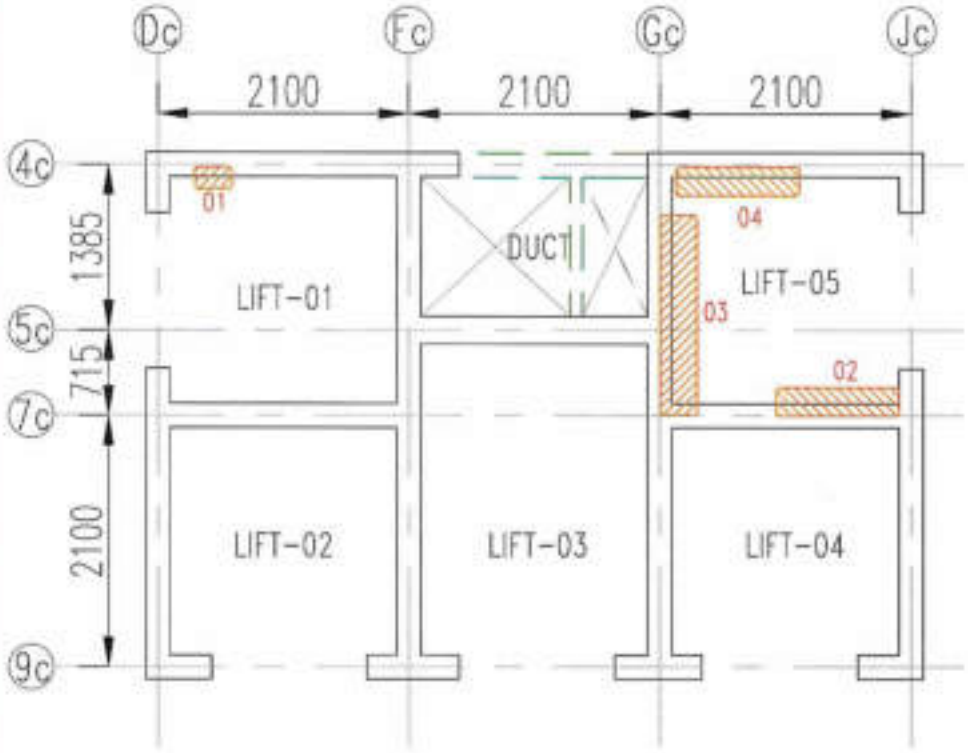



LIFT ELEVATIONS

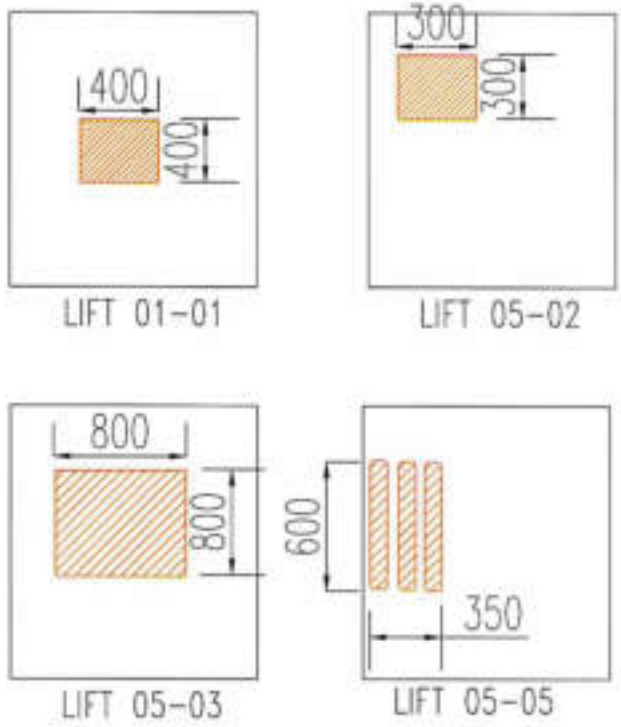
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 17th FLOOR** | DRAWN: RSKK | CHECKED: CHK/MBS; APPROVED: AJ/DH/KS |
| | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. REF. No: DM/LW/137/TC-19 | REV.No. R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |




18th FLOOR

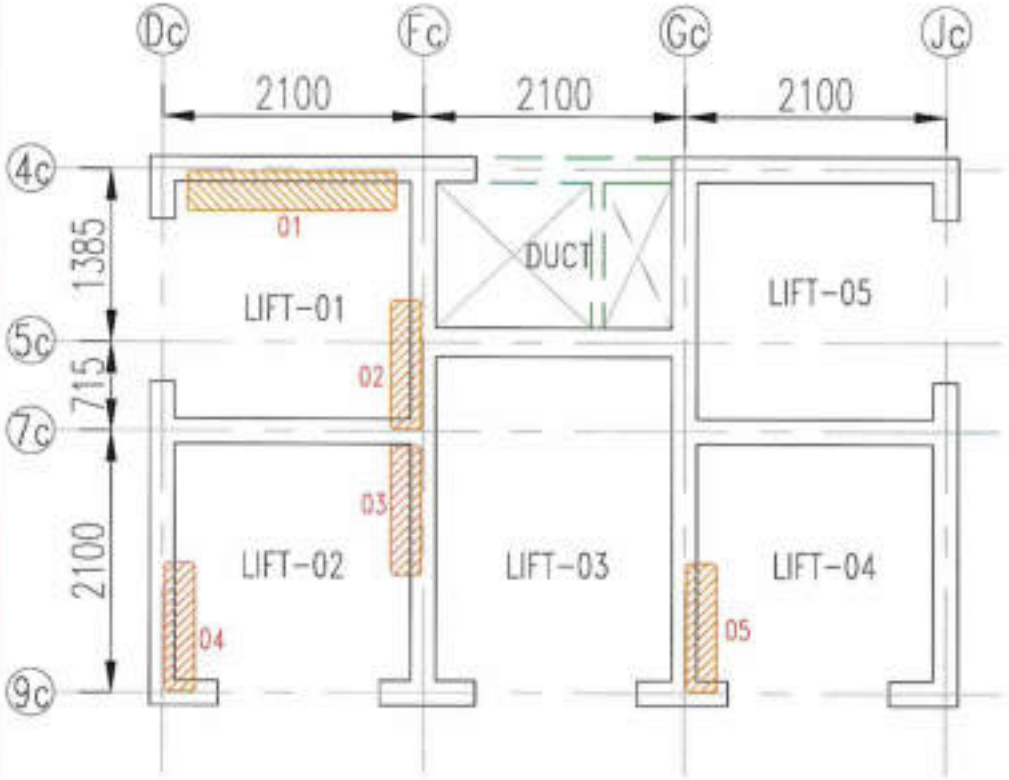



LIFT ELEVATIONS

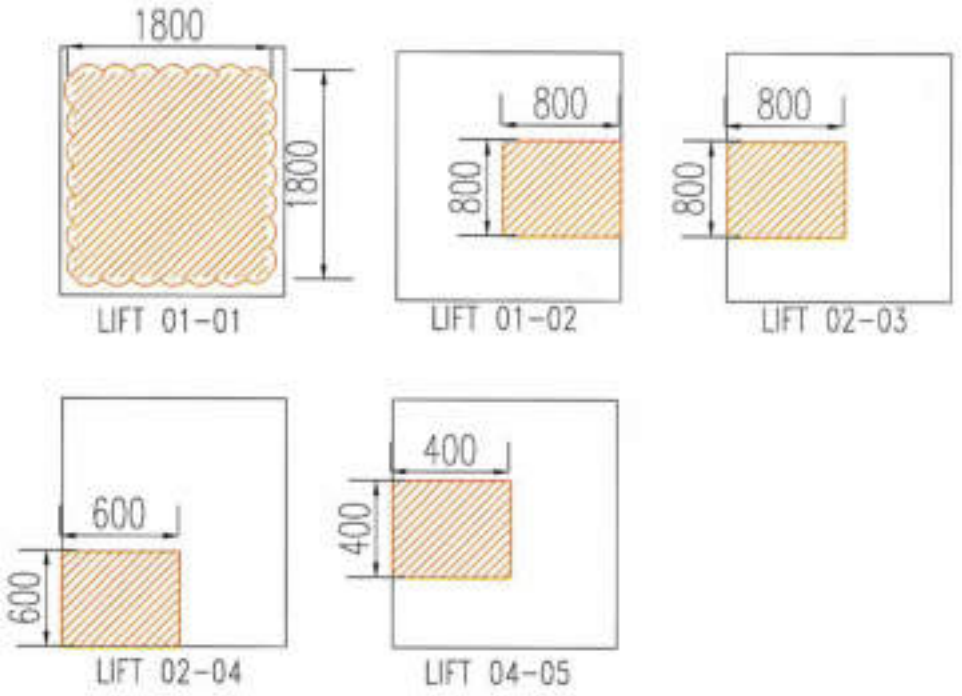
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 18th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. REF. No: BA/LM/15F/TC-28 | REV.No: R0 |
| | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 | |




19th FLOOR




LIFT ELEVATIONS

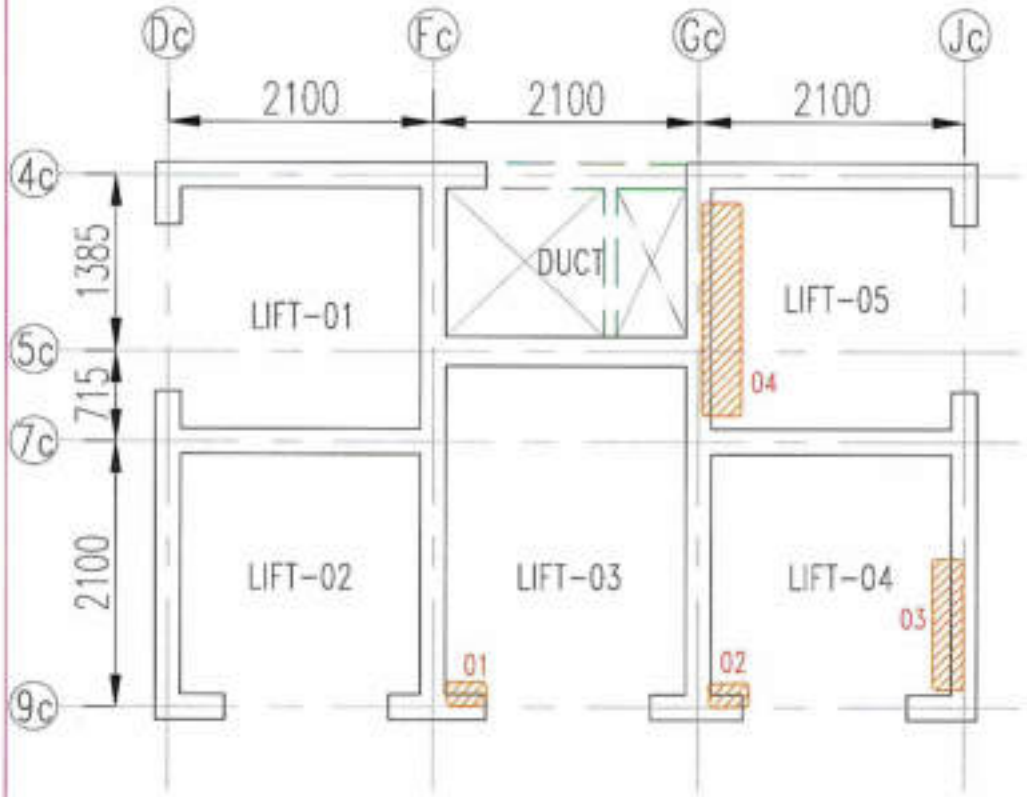
**LEGEND:**

MINOR CORROSION CRACKS AND DEBOUNDED PLASTER

MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER

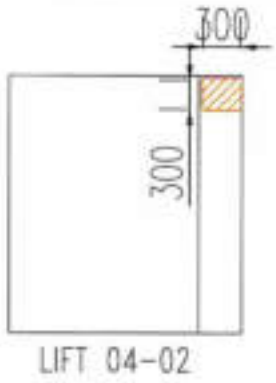
MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 19th FLOOR** | DRAWN: RSKK; CHECKED: CHR/MRS; APPROVED: AJ/DK.KS | SCALE: NTS; DATE: 24-04-2023; DWG. REF. No: BM/LN/19F/TC-21; REV.No: R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |

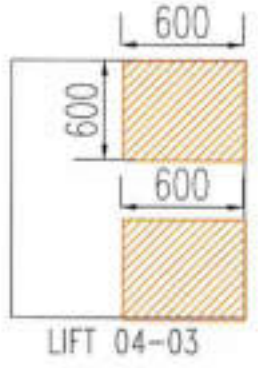



20th FLOOR

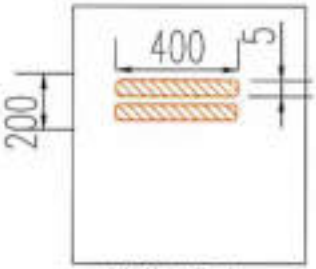
LIFT 03-01




LIFT 04-02




LIFT 04-03



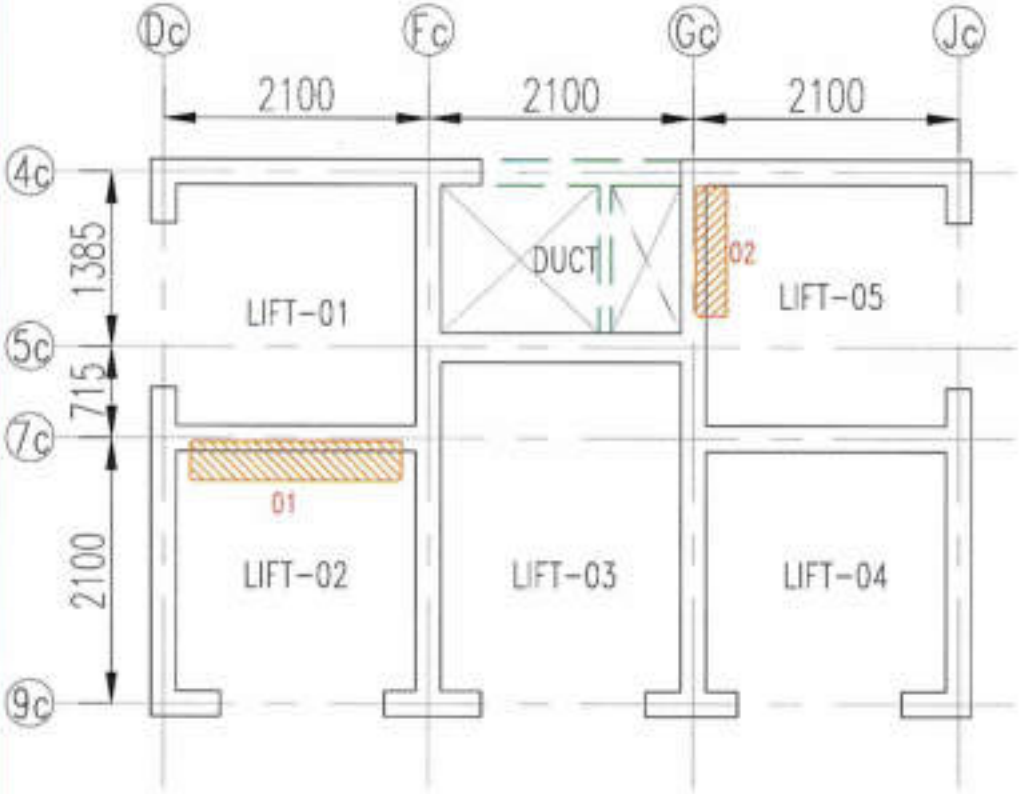

LIFT 05-4

## LIFT ELEVATIONS

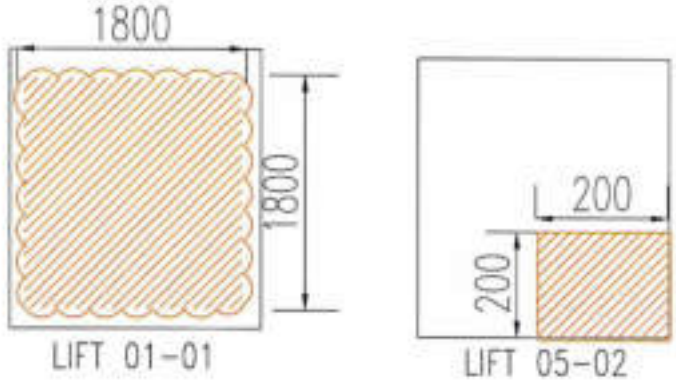
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 20th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERODU ARMY TOWERS" AT SELFER SAND ISLAND, VYTILLA, KOCHI, KERALA | | SCALE: NTS | DATE: 24-04-2023 |
| | | DWG. REF. No: DM/LN/20F/TC-22 | REV.No: R0 |
| CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17671143 | |




21st FLOOR

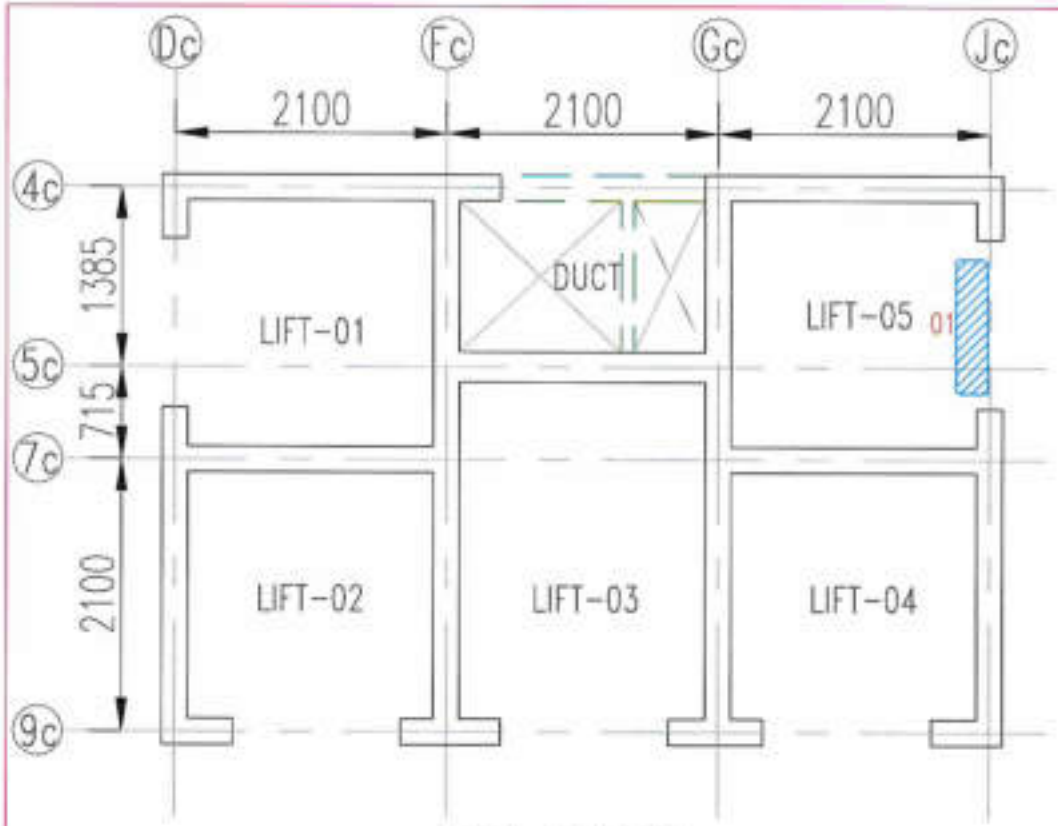



LIFT ELEVATIONS

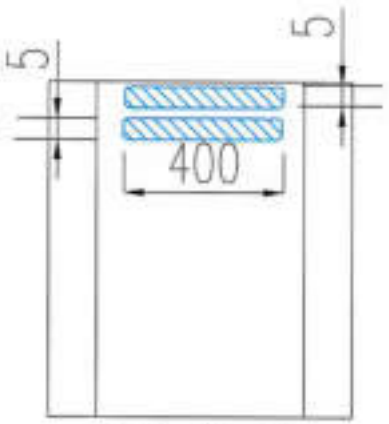
**LEGEND:**

- MINOR CORROSION CRACKS AND DEBOUNDED PLASTER
- MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER
- MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 21st FLOOR** | DRAWN: RSKK; CHECKED: CHR/MBS; APPROVED: AJ/Dr.KS | SCALE: NTS; DATE: 24-04-2023; DWG. REF. No: DN/LR/21F/TC-23; REV.No: R0 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDERKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. | CONTRACT NO: 17671143 |




26th FLOOR




LIFT 05-01

LIFT ELEVATIONS

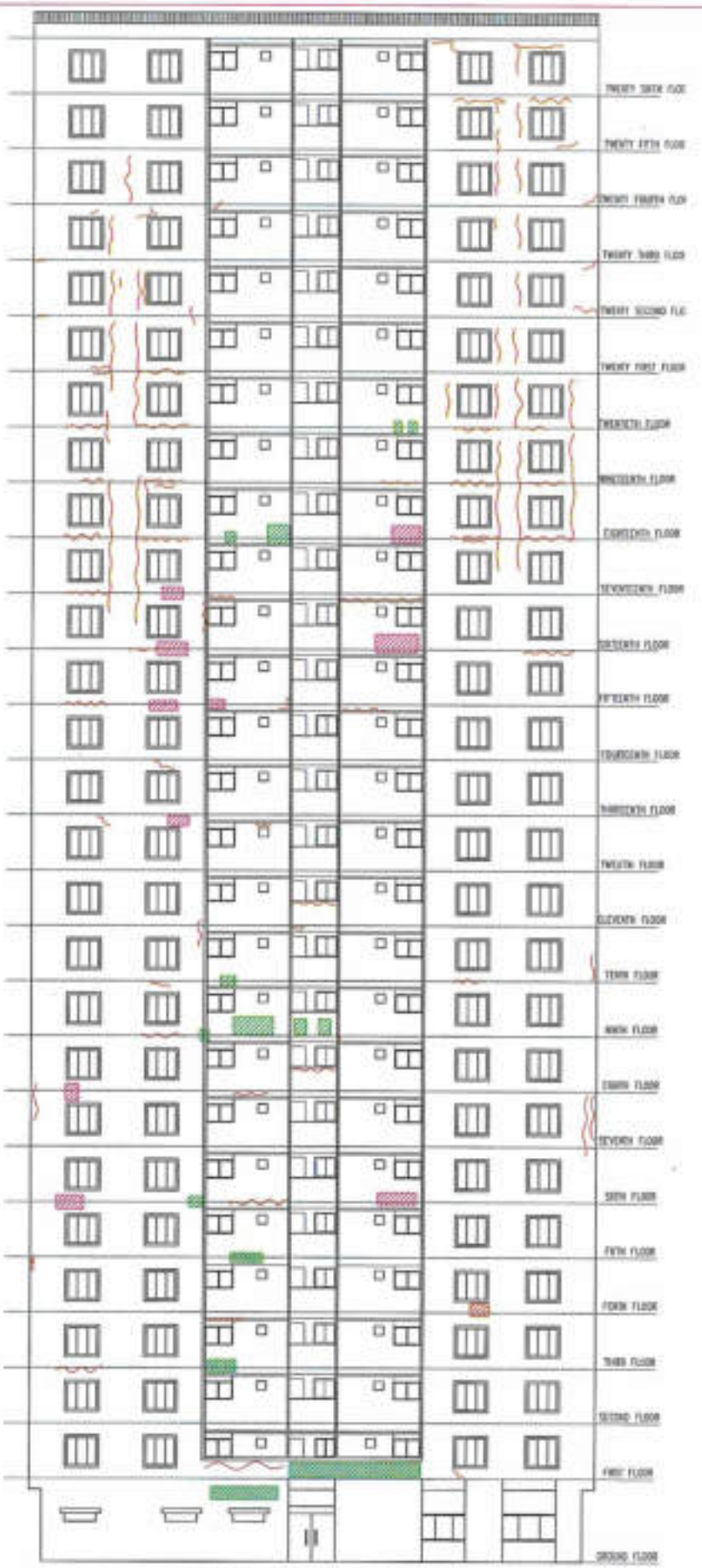
**LEGEND:**

MINOR CORROSION CRACKS AND DEBOUNDED PLASTER

MODERATE CORROSION CRACKS AND DEBOUNDED PLASTER

MAJOR CORROSION CRACKS AND SPALLING OF PLASTER

| | | | | |
|---|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **DISTRESS LAYOUT OF TOWER C - LIFT - 26th FLOOR** | DRAWN: RSKK | CHECKED: CHR/MRS | SCALE: NTS |
| | | | APPROVED: AJ/Dr.KG | DATE: 29-04-2023 |
| PROJECT: INVESTIGATION OF DISTRESS IN LIFT - TOWER B AND LIFT- TOWER C OF ARMY WELFARE HOUSING ORGANISATION "CHANDRIKUNJ ARMY TOWERS" AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | DWG. REF. No: DM/LW/26F/TC-25 REV.No. R0 |
| | | | | CONTRACT NO: 17671143 |



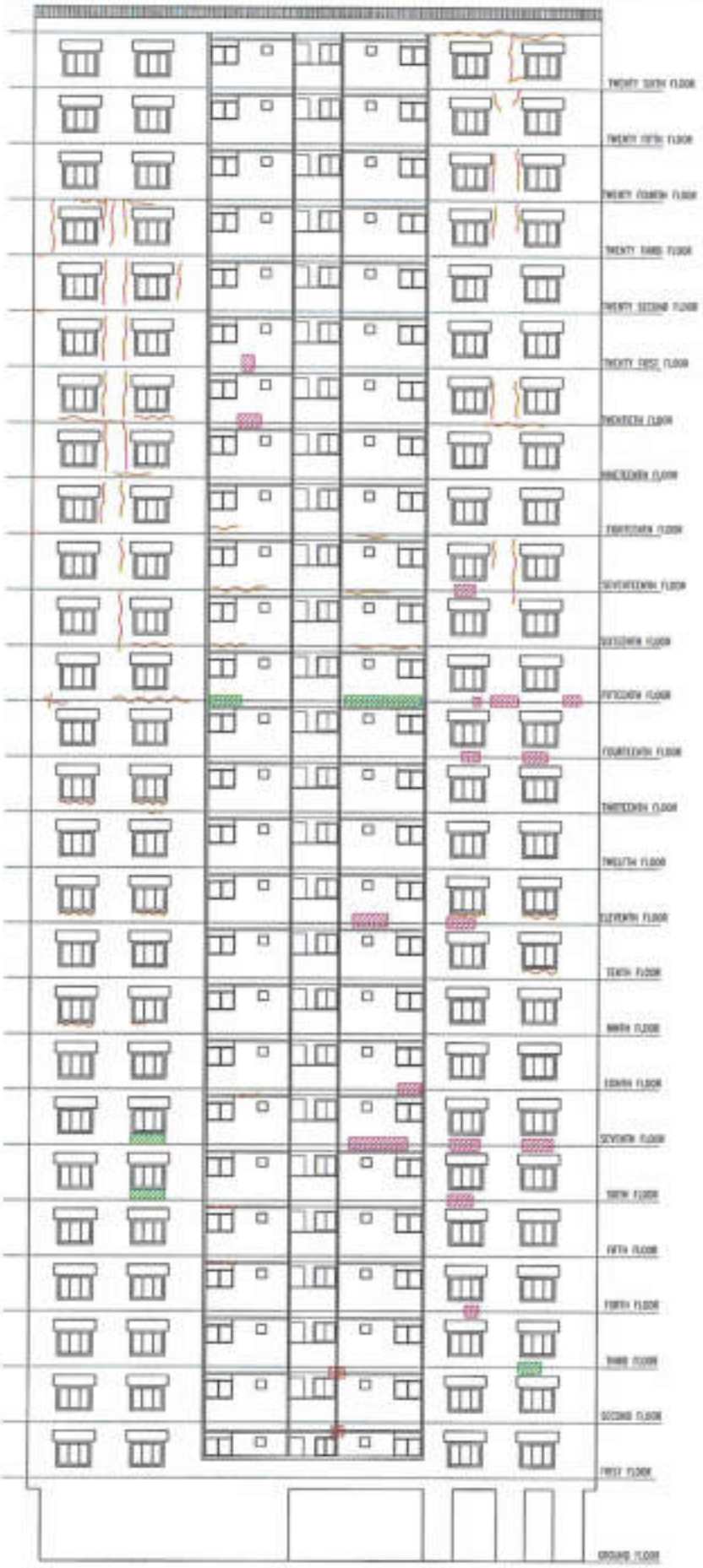
TOWER-C-ELEVATION-01(WEST SIDE)

LEGEND:

- CRACKS
- DEBOND OF PLASTER
- PATCHUP WORK

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: DISTRESS LAYOUT OF TOWER-C | DRAWN: RSKR | CHECKED: CM/ MBS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERSEKU ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | |

| | | |
|---|---|---|
| SCALE: NTS | DATE: 24-04-2023 | |
| DWG. REF. No : DM/EL/TC-01 | REV.No. 00 | |
| CONTRACT NO: 1767143 | | |



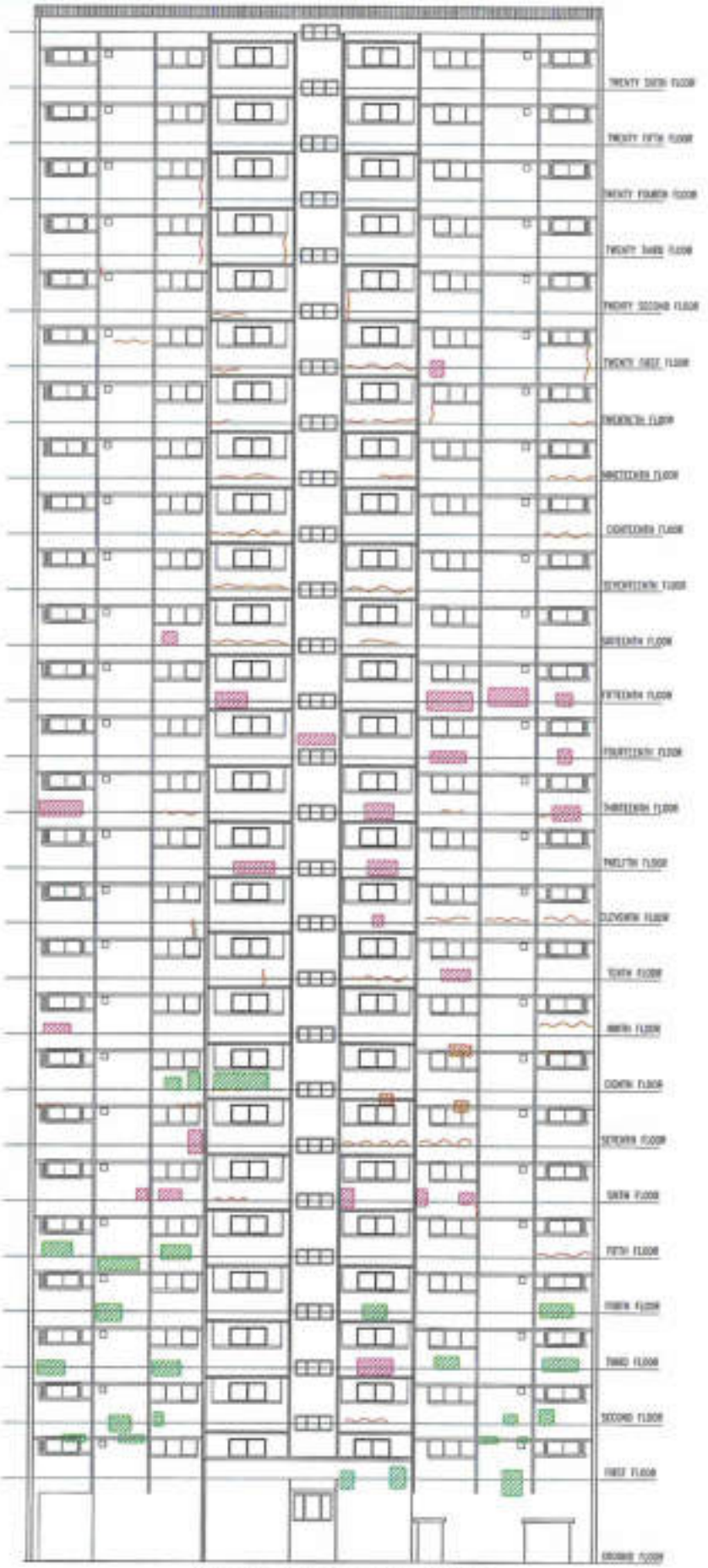
LEGEND:

- CRACKS
- DEBOND OF PLASTER
- PATCHUP WORK

TOWER-C-ELEVATION-02(EAST SIDE)

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: DISTRESS LAYOUT OF TOWER-C | DRAWN: RSKK | CHECKED: CMR/MDS |
| | | | APPROVED: AJ/Dr.KS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHAIRMANSHIP ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 105, 13th Cross, Banashankari 3rd Stage, Bangalore - 560 085 Tel. : 080-26695555 | |

| | |
|---|---|
| SCALE: NTS | DATE: 24-06-2023 |
| DWG. REF. No : BN/TL/TC-02 | REV.No. 00 |
| CONTRACT NO: 17671143 | |

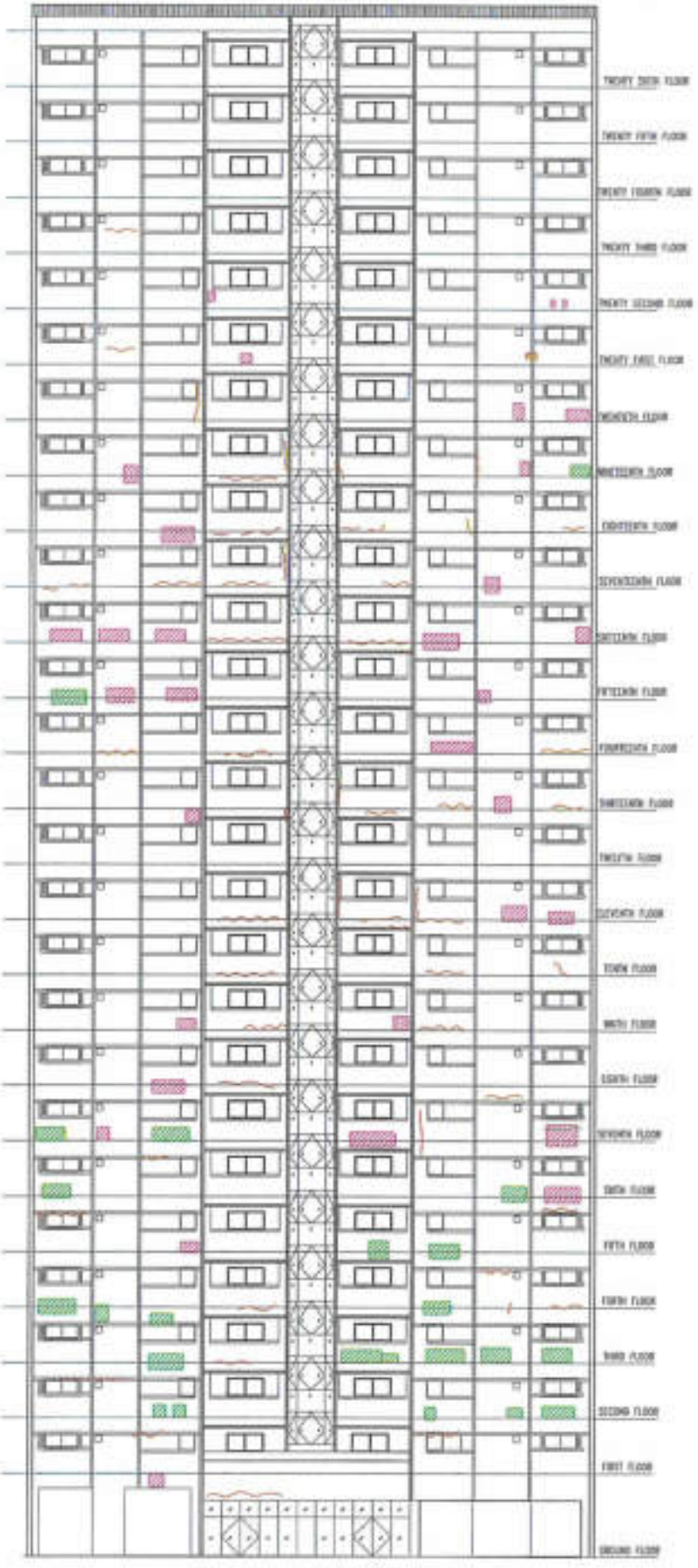


LEGEND:

- CRACKS
- DEBOND OF PLASTER
- PATCHUP WORK

TOWER-C-ELEVATION-03(NORTH SIDE)

| | | | |
|---|---|---|---|
| CLIENT: H/o ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: DISTRESS LAYOUT OF TOWER-C | DRAWN: RSKK / CHECKED: CHE/MBS / APPROVED: AJ/Dr.RS | SCALE: NTS; DATE: 24-04-2023; DWG. REF. No : DR/TL/TC-03; REV.No. 00 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHARACTERISTIC ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANT: BUREAU VERITAS (INDIA) PVT. LTD. | | CONTRACT NO: 17KP1143 |




LEGEND:

- CRACKS
- DEBOND OF PLASTER
- PATCHUP WORK

TOWER-C-ELEVATION-04(SOUTH SIDE)

| | | | |
|---|---|---|---|
| CLIENT: M/s ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: DISTRESS LAYOUT OF TOWER-C | DRAWN: RSKK | CHECKED: CHR/MBS |
| | | | APPROVED: AJ/DrKS |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDRIKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | COMPANY: BUREAU VERITAS (INDIA) PVT. LTD. | |

| | |
|---|---|
| SCALE: NTS | DATE: 24-04-2023 |
| DWG. REF. No : DM/TL/TC-04 | REV.No. 00 |
| CONTRACT NO: 17021142 | |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Concrete Frame Design

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C1 | 32 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.784 |
| Bottom | 24632 | 5.03 | 0.787 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 10470.474 | 328.4937 | 1.4879 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 10514.7814 | -329.8837 | -4.5709 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4601 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4601 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5766 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.5766 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C2 | 33 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.732 |
| Bottom | 19706 | 4.02 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8649.5754 | -271.366 | -0.5231 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8693.8828 | -272.7561 | -0.4845 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.0236 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.0236 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2364 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2364 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C3 | 34 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.781 |
| Bottom | 24632 | 5.03 | 0.784 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 10429.9829 | 327.2233 | -3.9446 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 10474.2903 | -328.6134 | 5.1354 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7189 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7189 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.0283 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.0283 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C4 | 35 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.724 |
| Bottom | 19706 | 4.02 | 0.728 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8552.6311 | -268.3245 | -0.3916 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8596.9386 | -269.7146 | 0.2014 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2455 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2455 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1621 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1621 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C5 | 36 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.784 |
| Bottom | 24632 | 5.03 | 0.786 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 10467.7724 | -2.7609 | -328.4089 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 10497.3107 | 329.3356 | 3.5471 | 804 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2634 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2634 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8051 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.8051 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C6 | 37 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.741 |
| Bottom | 19706 | 4.02 | 0.743 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8751.3499 | -1.4967 | 274.559 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8795.6574 | 275.9491 | -6.2916 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6498 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.6498 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2444 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2444 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C7 | 38 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.775 |
| Bottom | 24632 | 5.03 | 0.778 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 10353.3756 | -1.4756 | 324.8199 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 10397.683 | 326.21 | -6.5028 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9795 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9795 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6021 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6021 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C8 | 39 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.758 |
| Bottom | 19706 | 4.02 | 0.761 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8957.3048 | -3.4694 | -281.0205 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 9001.6123 | 282.4106 | 3.3707 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0677 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0677 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8557 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8557 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C9 | 40 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.694 |
| Bottom | 17242 | 2.87 | 0.698 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8524.0035 | 239.0131 | 2.2531 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8578.2575 | 240.5343 | 2.7193 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.1776 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.1776 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.5186 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.5186 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C10 | 41 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.712 |
| Bottom | 17242 | 2.87 | 0.717 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8747.3606 | 245.276 | -0.0603 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8801.6146 | -246.7973 | 1.359 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.5822 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.5822 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.9484 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.9484 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C11 | 42 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.679 |
| Bottom | 17242 | 2.87 | 0.684 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8343.8853 | -233.9625 | 2.2936 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8398.1393 | 235.4838 | 2.1531 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.0712 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.0712 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.4325 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.4325 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C12 | 43 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.689 |
| Bottom | 17242 | 2.87 | 0.694 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8465.9242 | -237.3845 | 0.3433 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 8520.1781 | 238.9058 | 0.2307 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.0482 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.0482 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.3007 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.3007 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C1 | 231 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.743 |
| Bottom | 24632 | 5.03 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9916.943 | -0.714 | -314.6977 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 9963.2343 | -316.1666 | 5.9264 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9557 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9557 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2896 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2896 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C2 | 232 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.726 |
| Bottom | 19706 | 4.02 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8573.7458 | 272.0735 | -0.501 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8620.0371 | 273.5425 | -0.5278 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.0236 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.0236 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2364 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2364 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C3 | 233 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.736 |
| Bottom | 24632 | 5.03 | 0.739 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9822.8985 | -0.9887 | 311.7133 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 9869.1898 | -313.1823 | -3.4915 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7543 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.7543 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4614 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4614 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C4 | 234 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.718 |
| Bottom | 19706 | 4.02 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8476.8015 | 268.9972 | -1.3187 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8523.0929 | 270.4661 | -0.7739 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2455 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2455 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1621 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1621 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C5 | 235 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.734 |
| Bottom | 24632 | 5.03 | 0.737 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9795.8419 | 1.1362 | -310.8547 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 9842.1333 | 3.4208 | 312.3237 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.6386 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.6386 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8289 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8289 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C6 | 236 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.709 |
| Bottom | 19706 | 4.02 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8377.3925 | -265.8426 | -4.2768 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8423.6838 | 267.3116 | -10.9052 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6454 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6454 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.289 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.289 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C7 | 237 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.74 |
| Bottom | 24632 | 5.03 | 0.743 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9871.5061 | -0.2919 | 313.2558 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 9917.7975 | 1.7848 | -314.7248 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.5318 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.5318 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7289 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7289 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C8 | 238 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.723 |
| Bottom | 19706 | 4.02 | 0.725 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8536.4277 | -270.8893 | 0.9398 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8582.7191 | 272.3583 | 9.0492 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2543 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2543 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9703 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.9703 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C9 | 239 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.675 |
| Bottom | 17242 | 2.87 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8291.8532 | 235.4886 | 1.7869 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8348.5365 | -237.0984 | -1.7877 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4587 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4587 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.2444 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.2444 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C10 | 240 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.693 |
| Bottom | 17242 | 2.87 | 0.698 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8511.0246 | 241.7131 | 1.4954 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8567.7079 | -243.3229 | 2.3124 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.3074 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.3074 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.8934 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.8934 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C11 | 241 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.661 |
| Bottom | 17242 | 2.87 | 0.665 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8114.6149 | -230.4551 | 1.9722 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8171.2982 | 232.0649 | -1.5988 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4564 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4564 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.1963 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.1963 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C12 | 242 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.671 |
| Bottom | 17242 | 2.87 | 0.675 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8234.9256 | -233.8719 | 1.6439 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8291.6088 | 235.4817 | 1.6655 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.0078 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.0078 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.6 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.6 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C1 | 474 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.853 |
| Bottom | 17672 | 3.61 | 0.854 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9555.6726 | 285.0776 | -1.3676 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 9591.4932 | 9.7433 | 286.1462 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1017 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1017 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9906 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9906 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C2 | 475 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.825 |
| Bottom | 13745 | 2.81 | 0.828 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8235.4903 | 245.6921 | -2.5356 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8271.3109 | -4.2414 | -246.7608 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8081 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.8081 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7143 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.7143 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C3 | 476 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.845 |
| Bottom | 17672 | 3.61 | 0.846 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9461.0199 | 282.2538 | -0.4665 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 9496.8406 | 9.8874 | -283.3224 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2287 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2287 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6009 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6009 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C4 | 477 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.816 |
| Bottom | 13745 | 2.81 | 0.819 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8138.4672 | 242.7976 | 1.7581 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8174.2878 | -2.1517 | 243.8663 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4511 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.4511 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7333 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7333 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C5 | 478 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.841 |
| Bottom | 17672 | 3.61 | 0.843 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9417.2246 | -280.9472 | -1.6446 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 9453.0453 | -5.5528 | 282.0159 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8609 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.8609 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.747 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.747 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C6 | 479 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.804 |
| Bottom | 13745 | 2.81 | 0.805 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8021.8943 | 0.8918 | 239.3198 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8057.7149 | 10.3229 | -240.3885 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1714 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1714 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8761 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8761 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C7 | 480 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.851 |
| Bottom | 17672 | 3.61 | 0.853 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9532.027 | 0.7988 | 284.3721 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 9567.8477 | -5.293 | -285.4408 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9406 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.9406 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1489 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1489 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C8 | 481 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.821 |
| Bottom | 13745 | 2.81 | 0.822 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8186.9154 | -244.243 | 1.4983 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8222.7361 | 7.6335 | 245.3116 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2733 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.2733 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0091 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.0091 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C9 | 482 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.715 |
| Bottom | 13745 | 2.29 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8025.3157 | 212.6709 | 3.1544 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8069.1777 | -213.8332 | -2.1276 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.7715 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.7715 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.1029 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.1029 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C10 | 483 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.734 |
| Bottom | 13745 | 2.29 | 0.737 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8240.3129 | 218.3683 | 2.1102 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8284.175 | -219.5306 | 7.8589 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8802 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8802 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.0194 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.0194 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C11 | 484 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.701 |
| Bottom | 13745 | 2.29 | 0.705 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7870.2723 | 208.5622 | 2.5398 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 7914.1343 | 209.7246 | -2.5334 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.6636 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.6636 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.4321 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.4321 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C12 | 485 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.711 |
| Bottom | 13745 | 2.29 | 0.714 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7980.0398 | 211.4711 | 2.167 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8023.9019 | 212.6334 | 6.9083 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.366 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.366 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.2539 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.2539 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C1 | 701 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.87 |
| Bottom | 15709 | 3.21 | 0.873 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9206.5847 | 0.084 | -272.8218 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 9241.3032 | -1.2376 | 273.8506 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5277 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.5277 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8869 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8869 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C2 | 702 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.821 |
| Bottom | 12763 | 2.6 | 0.824 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7941.3047 | 2.3098 | 235.3273 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7976.0232 | -236.3562 | 4.1233 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3738 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3738 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0558 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.0558 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C3 | 703 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.861 |
| Bottom | 15709 | 3.21 | 0.863 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9112.2297 | 0.04 | 270.0257 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 9146.9482 | -4.7425 | -271.0546 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2536 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2536 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7042 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7042 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C4 | 704 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.811 |
| Bottom | 12763 | 2.6 | 0.813 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7843.3879 | 1.8536 | -232.4257 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7878.1064 | -233.4546 | -6.8707 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8071 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8071 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9211 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.9211 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C5 | 705 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.856 |
| Bottom | 15709 | 3.21 | 0.858 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9066.6072 | 268.6738 | -1.2046 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 9101.3257 | 7.0928 | 269.7026 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7413 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7413 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8845 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.8845 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C6 | 706 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.8 |
| Bottom | 12763 | 2.6 | 0.803 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7733.1076 | 0.2021 | 229.1578 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7767.8261 | 230.1866 | -0.3221 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.4803 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.4803 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6889 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6889 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C7 | 707 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.866 |
| Bottom | 15709 | 3.21 | 0.869 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9171.2851 | 271.7757 | 1.771 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 9206.0036 | -2.5863 | -272.8046 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.3407 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.3407 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3946 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.3946 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C8 | 708 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.816 |
| Bottom | 12763 | 2.6 | 0.817 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7888.6651 | -1.2747 | -233.7674 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7923.3836 | 234.7963 | -8.6055 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3971 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3971 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8713 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.8713 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C9 | 709 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.711 |
| Bottom | 12763 | 2.13 | 0.715 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7768.5547 | 204.313 | 3.6818 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7811.0672 | -205.4311 | -0.6826 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.4089 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.4089 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.1044 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.1044 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C10 | 710 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.731 |
| Bottom | 12763 | 2.13 | 0.733 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7979.1378 | 209.8513 | 1.0913 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8021.6503 | -210.9694 | 7.4292 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2442 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.2442 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.9767 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.9767 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C11 | 711 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.697 |
| Bottom | 12763 | 2.13 | 0.701 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7612.0918 | -200.198 | 3.173 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7654.6042 | 201.3161 | -1.6479 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.6387 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.6387 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.1151 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.1151 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C12 | 712 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.707 |
| Bottom | 12763 | 2.13 | 0.71 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7720.2274 | -203.042 | 0.9191 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7762.7398 | 204.1601 | 4.3649 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.7268 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.7268 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.9923 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.9923 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C1 | 928 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.789 |
| Bottom | 9818 | 2 | 0.792 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6902.8722 | 0.4309 | -204.5551 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6937.5907 | 1.5447 | 205.5839 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.3743 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 17.3743 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.255 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.255 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C2 | 929 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.676 |
| Bottom | 9818 | 2 | 0.678 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5930.3775 | 175.7369 | -4.0303 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5941.9504 | -176.0798 | 3.9544 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6502 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.6502 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.1109 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.1109 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C3 | 930 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.778 |
| Bottom | 9818 | 2 | 0.782 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6809.0956 | 0.832 | 201.7762 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6843.8141 | -0.0895 | -202.805 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.526 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.526 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8105 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8105 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C4 | 931 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.666 |
| Bottom | 9818 | 2 | 0.666 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5830.4331 | 172.7752 | 2.2169 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5842.0059 | -3.9385 | -173.1181 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.2585 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.2585 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.0843 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.0843 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C5 | 932 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.772 |
| Bottom | 9818 | 2 | 0.775 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6758.856 | 0.7606 | -200.2874 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6793.5745 | 3.3717 | 201.3163 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.9725 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.9725 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1636 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1636 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C6 | 933 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.658 |
| Bottom | 9818 | 2 | 0.659 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5762.5954 | -170.7649 | -1.7415 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5774.1682 | 171.1079 | 3.3275 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0352 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.0352 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6897 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.6897 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C7 | 934 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.78 |
| Bottom | 9818 | 2 | 0.783 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6828.0275 | 0.5918 | 202.3372 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6862.746 | 4.1368 | -203.366 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.4949 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 22.4949 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6269 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6269 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C8 | 935 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.669 |
| Bottom | 9818 | 2 | 0.669 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5865.8186 | -173.8238 | 4.5295 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5877.3915 | 7.1743 | -174.1667 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.4545 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.4545 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.9059 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.9059 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C9 | 936 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.583 |
| Bottom | 9818 | 1.64 | 0.588 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5835.0632 | 153.4622 | 2.5453 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5877.5756 | -154.5802 | -0.6225 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.9263 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.9263 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.054 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.054 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C10 | 937 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.601 |
| Bottom | 9818 | 1.64 | 0.605 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6014.7144 | 158.187 | 0.4815 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6057.2269 | -159.3051 | 6.2914 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8666 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8666 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.7002 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 7.7002 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C11 | 938 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.565 |
| Bottom | 9818 | 1.64 | 0.57 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5656.9441 | -148.7776 | 2.1822 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5699.4565 | 149.8957 | 1.68 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.515 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.515 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.2573 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.2573 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C12 | 939 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.575 |
| Bottom | 9818 | 1.64 | 0.579 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5755.8419 | -151.3786 | 0.6352 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5798.3543 | 152.4967 | 5.0392 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.1265 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.1265 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.3214 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.3214 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C1 | 1155 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.824 |
| Bottom | 9818 | 2 | 0.827 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7217.1452 | 3.6947 | 213.8681 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7251.8637 | -5.651 | 214.8969 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6875 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6875 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1796 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1796 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C2 | 1156 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.709 |
| Bottom | 9818 | 2 | 0.713 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6213.3619 | 2.1839 | 184.1226 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6248.0804 | -185.1514 | 2.299 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3316 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3316 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1811 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1811 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C3 | 1157 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.813 |
| Bottom | 9818 | 2 | 0.816 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7123.3728 | 4.4828 | -211.0893 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7146.5185 | -3.4615 | -211.7752 | 630 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6281 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6281 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5106 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5106 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C4 | 1158 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.698 |
| Bottom | 9818 | 2 | 0.701 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6113.5585 | 2.6146 | -181.1651 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6148.277 | -182.1939 | -4.3266 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8186 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8186 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9844 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9844 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C5 | 1159 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.808 |
| Bottom | 9818 | 2 | 0.809 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7073.8059 | -2.8101 | 209.6204 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7085.3787 | 1.4563 | 209.9634 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7007 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7007 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4658 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.4658 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C6 | 1160 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.69 |
| Bottom | 9818 | 2 | 0.693 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6039.4038 | -0.0219 | 178.9677 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6074.1223 | 179.9965 | -2.5546 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9179 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9179 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6604 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.6604 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C7 | 1161 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.817 |
| Bottom | 9818 | 2 | 0.819 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7144.6128 | -0.3556 | -211.7187 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7179.3313 | 5.6214 | -212.7475 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9298 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.9298 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9151 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9151 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C8 | 1162 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.702 |
| Bottom | 9818 | 2 | 0.703 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6148.6626 | -1.2322 | -182.2054 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6183.3811 | 183.2342 | -11.0457 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.147 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.147 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4509 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.4509 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C9 | 1163 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.611 |
| Bottom | 9818 | 1.64 | 0.615 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6124.3169 | 161.0695 | 5.4926 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6166.8293 | -162.1876 | -7.2183 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.9339 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.9339 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.3898 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 9.3898 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C10 | 1164 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.63 |
| Bottom | 9818 | 1.64 | 0.632 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6308.452 | 165.9123 | -3.9936 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6350.9644 | -167.0304 | 14.819 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.7055 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 9.7055 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 12.2244 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 12.2244 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C11 | 1165 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.594 |
| Bottom | 9818 | 1.64 | 0.598 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5950.6506 | -156.5021 | 7.3183 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5993.163 | 157.6202 | -7.4522 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.0032 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.0032 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.4576 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 9.4576 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C12 | 1166 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.605 |
| Bottom | 9818 | 1.64 | 0.607 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6050.8991 | -159.1386 | -1.6659 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6093.4115 | 160.2567 | 11.5921 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.7908 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.7908 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.212 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 9.212 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C1 | 1382 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.805 |
| Bottom | 11782 | 2.4 | 0.808 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7536.5854 | 0.1954 | -223.3341 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7571.3039 | -1.9747 | 224.363 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.396 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.396 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.4175 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.4175 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C2 | 1383 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.716 |
| Bottom | 10800 | 2.2 | 0.72 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6497.6041 | 5.6305 | -192.5457 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6532.3226 | -193.5745 | 2.9751 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.76 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.76 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.856 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.856 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C3 | 1384 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.795 |
| Bottom | 11782 | 2.4 | 0.797 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7442.8301 | 0.8698 | 220.5559 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7477.5486 | -4.1132 | -221.5847 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2379 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2379 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8726 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.8726 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C4 | 1385 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.705 |
| Bottom | 10800 | 2.2 | 0.708 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6397.8956 | 189.591 | 3.1124 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6432.6141 | -190.6198 | -4.9978 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1527 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.1527 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5386 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.5386 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C5 | 1386 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.789 |
| Bottom | 11782 | 2.4 | 0.791 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7393.8616 | 0.4499 | -219.1048 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7428.5801 | 6.652 | 220.1336 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1112 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1112 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0471 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0471 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C6 | 1387 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.697 |
| Bottom | 10800 | 2.2 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6317.5857 | -3.1452 | -187.2111 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6352.3041 | 188.2399 | -1.6295 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8304 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8304 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3079 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3079 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C7 | 1388 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.797 |
| Bottom | 11782 | 2.4 | 0.8 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7467.6926 | 0.7209 | 221.2926 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7502.411 | 2.5787 | -222.3214 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.9453 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.9453 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.78 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.78 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C8 | 1389 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.709 |
| Bottom | 10800 | 2.2 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6433.2773 | -5.773 | 190.6394 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6444.8501 | 190.9824 | -0.8739 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3446 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3446 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.816 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.816 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C9 | 1390 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.621 |
| Bottom | 10800 | 1.8 | 0.625 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6409.4943 | 168.5697 | 2.161 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6452.0067 | -169.6878 | -4.6277 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.803 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.803 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.987 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.987 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C10 | 1391 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.64 |
| Bottom | 10800 | 1.8 | 0.642 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6597.9388 | 173.5258 | 0.8816 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6640.4513 | -174.6439 | 11.9858 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.6537 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.6537 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.8333 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 8.8333 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C11 | 1392 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.605 |
| Bottom | 10800 | 1.8 | 0.608 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6239.8781 | -164.1088 | 2.3509 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6282.3906 | 165.2269 | -5.0811 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1199 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.1199 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.081 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.081 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C12 | 1393 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.615 |
| Bottom | 10800 | 1.8 | 0.618 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6341.2042 | -166.7737 | 1.7789 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6383.7167 | 167.8917 | 8.6617 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.4471 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.4471 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.9638 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.9638 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C1 | 1609 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.839 |
| Bottom | 11782 | 2.4 | 0.843 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7860.9154 | 1.7862 | -232.9451 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7895.6339 | -1.9803 | 233.9739 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1396 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1396 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2365 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2365 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C2 | 1610 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.748 |
| Bottom | 10800 | 2.2 | 0.751 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6783.3041 | 4.2231 | -201.0119 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6818.0226 | -202.0407 | 3.3374 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1221 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1221 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8112 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.8112 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C3 | 1611 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.829 |
| Bottom | 11782 | 2.4 | 0.832 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7767.1424 | 2.2732 | 230.1663 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7801.8609 | -4.2549 | -231.1951 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9969 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9969 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.661 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.661 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C4 | 1612 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.737 |
| Bottom | 10800 | 2.2 | 0.74 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6683.7522 | 198.0619 | 1.5301 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6718.4707 | -199.0907 | -5.4233 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5163 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.5163 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4728 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.4728 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C5 | 1613 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.824 |
| Bottom | 11782 | 2.4 | 0.826 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7718.7631 | -0.9106 | -228.7327 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7753.4816 | 6.7779 | 229.7615 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.757 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.757 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8396 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.8396 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C6 | 1614 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.728 |
| Bottom | 10800 | 2.2 | 0.731 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6597.389 | -1.6465 | -195.5026 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6632.1075 | 196.5315 | -1.2655 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1496 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1496 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3378 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.3378 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C7 | 1615 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.833 |
| Bottom | 11782 | 2.4 | 0.836 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7796.5606 | -0.0686 | 231.0381 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7831.2791 | 2.0908 | -232.0669 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.3736 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.3736 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9472 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9472 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C8 | 1616 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.741 |
| Bottom | 10800 | 2.2 | 0.742 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6720.0368 | -4.0102 | 199.1371 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6731.6097 | 199.48 | -1.9203 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0974 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0974 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.425 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.425 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C9 | 1617 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.648 |
| Bottom | 10800 | 1.8 | 0.652 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6690.3048 | 175.955 | 3.3913 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6732.8173 | -177.0731 | -4.1917 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.2085 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.2085 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.8698 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.8698 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C10 | 1618 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.667 |
| Bottom | 10800 | 1.8 | 0.67 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6883.1093 | 181.0258 | -0.1501 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6925.6218 | -182.1439 | 11.1802 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7891 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.7891 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.5951 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 8.5951 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C11 | 1619 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.632 |
| Bottom | 10800 | 1.8 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6524.2331 | -171.5873 | 3.4252 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6566.7456 | 172.7054 | -4.554 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.395 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.395 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.9538 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.9538 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C12 | 1620 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.642 |
| Bottom | 10800 | 1.8 | 0.645 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6626.7433 | -174.2833 | 0.5109 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6669.2557 | 175.4014 | 8.0593 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.8148 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.8148 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.8401 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.8401 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C1 | 1836 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.821 |
| Bottom | 13745 | 2.81 | 0.824 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8190.2294 | 1.4205 | -242.7038 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8224.9479 | -1.449 | 243.7326 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6818 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.6818 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7399 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7399 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C2 | 1837 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.755 |
| Bottom | 11782 | 2.4 | 0.758 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7070.5952 | 209.5253 | -1.3712 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7105.3137 | -210.5541 | 2.4021 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1308 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1308 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.318 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.318 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C3 | 1838 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.811 |
| Bottom | 13745 | 2.81 | 0.814 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8096.4012 | 1.8546 | 239.9234 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8131.1197 | -3.854 | -240.9522 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5258 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.5258 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2047 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2047 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C4 | 1839 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.744 |
| Bottom | 11782 | 2.4 | 0.747 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6971.28 | 206.5823 | 0.4798 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7005.9985 | -207.6111 | -4.5417 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5022 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5022 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9894 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.9894 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C5 | 1840 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.807 |
| Bottom | 13745 | 2.81 | 0.809 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8048.6258 | -0.4361 | -238.5076 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8083.3443 | 6.3825 | 239.5364 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3139 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3139 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3974 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3974 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C6 | 1841 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.734 |
| Bottom | 11782 | 2.4 | 0.738 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6878.9341 | -203.8457 | -0.4387 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6913.6526 | 204.8746 | -2.0308 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7438 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7438 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9567 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.9567 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C7 | 1842 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.815 |
| Bottom | 13745 | 2.81 | 0.818 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8131.4295 | 0.4566 | 240.9614 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8166.148 | 1.1227 | -241.9902 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.7858 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.7858 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1764 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1764 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C8 | 1843 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.748 |
| Bottom | 11782 | 2.4 | 0.749 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7009.0536 | -207.7016 | 1.6644 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7043.7721 | 208.7304 | -9.2864 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6736 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.6736 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6828 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.6828 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C9 | 1844 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.656 |
| Bottom | 11782 | 1.96 | 0.66 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6967.0118 | 183.2324 | 3.3413 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7009.5242 | -184.3505 | -3.6653 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.8853 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.8853 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.3956 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.3956 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C10 | 1845 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.675 |
| Bottom | 11782 | 1.96 | 0.677 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7164.2182 | 188.4189 | 0.1011 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7206.7307 | -189.537 | 10.4166 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.2701 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.2701 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.931 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 7.931 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C11 | 1846 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.64 |
| Bottom | 11782 | 1.96 | 0.644 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6803.9923 | -178.945 | 3.3588 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6846.5047 | 180.0631 | -4.0482 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.0745 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.0745 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.4507 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.4507 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C12 | 1847 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.651 |
| Bottom | 11782 | 1.96 | 0.654 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6907.7802 | -181.6746 | 0.6815 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6950.2927 | 182.7927 | 7.4706 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.4303 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.4303 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.328 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.328 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C1 | 2063 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.854 |
| Bottom | 13745 | 2.81 | 0.858 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8524.3649 | 1.35 | -252.6053 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8559.0834 | -0.9335 | 253.6342 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.4866 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.4866 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.4052 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.4052 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C2 | 2064 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.786 |
| Bottom | 11782 | 2.4 | 0.789 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7359.3868 | 218.0832 | -1.1406 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7394.1053 | -219.112 | 1.5462 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5438 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.5438 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9375 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.9375 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C3 | 2065 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.845 |
| Bottom | 13745 | 2.81 | 0.848 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8430.4315 | 1.7149 | 249.8218 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8465.15 | -3.4912 | -250.8506 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3194 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3194 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9164 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9164 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C4 | 2066 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.775 |
| Bottom | 11782 | 2.4 | 0.778 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7260.4068 | 215.1501 | 0.1103 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7295.1253 | -216.1789 | -3.7348 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8961 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8961 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.6337 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C5 | 2067 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.84 |
| Bottom | 13745 | 2.81 | 0.842 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8383.3035 | -0.2574 | -248.4252 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8418.022 | 5.9397 | 249.4541 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1143 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.1143 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0931 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0931 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C6 | 2068 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.765 |
| Bottom | 11782 | 2.4 | 0.768 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7162.1129 | -212.2373 | -0.1475 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7196.8314 | 213.2661 | -2.758 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.2933 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.2933 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6821 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6821 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C7 | 2069 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.849 |
| Bottom | 13745 | 2.81 | 0.853 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8472.2158 | 0.6592 | 251.06 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8506.9343 | -0.0323 | -252.0888 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4077 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.4077 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5188 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.5188 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C8 | 2070 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.779 |
| Bottom | 11782 | 2.4 | 0.781 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7300.2044 | -216.3294 | 1.2658 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7334.9229 | 217.3582 | -7.628 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5989 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.5989 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.0658 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.0658 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C9 | 2071 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.681 |
| Bottom | 11782 | 1.96 | 0.685 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7239.271 | 190.3928 | 3.3143 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7281.7834 | -191.5109 | -3.0217 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5093 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.5093 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.8513 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.8513 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C10 | 2072 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.701 |
| Bottom | 11782 | 1.96 | 0.703 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7440.9261 | 195.6964 | 0.4277 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7483.4385 | -196.8144 | 9.5125 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.6411 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.6411 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.2041 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 7.2041 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C11 | 2073 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.666 |
| Bottom | 11782 | 1.96 | 0.67 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7078.849 | -186.1737 | 3.25 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7121.3614 | 187.2918 | -3.4237 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.6667 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.6667 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.8928 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.8928 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C12 | 2074 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.677 |
| Bottom | 11782 | 1.96 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7184.006 | -188.9394 | 0.8932 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7226.5184 | 190.0574 | 6.7535 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.9594 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.9594 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.7584 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.7584 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C1 | 2290 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.837 |
| Bottom | 15709 | 3.21 | 0.84 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8863.2259 | 0.9189 | -262.6469 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8897.9444 | -1.2234 | 263.6758 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9683 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9683 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3114 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3114 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C2 | 2291 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.791 |
| Bottom | 12763 | 2.6 | 0.794 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7649.6134 | 226.6835 | -0.4721 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7684.3319 | -227.7124 | 1.5342 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1819 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1819 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5725 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.5725 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C3 | 2292 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.828 |
| Bottom | 15709 | 3.21 | 0.831 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8769.1245 | 259.8584 | 1.0342 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8803.843 | -3.8468 | -260.8872 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8678 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8678 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.832 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.832 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C4 | 2293 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.781 |
| Bottom | 12763 | 2.6 | 0.783 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7551.0918 | 223.764 | -0.758 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7585.8103 | -224.7928 | -3.9061 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5627 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.5627 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.305 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.305 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C5 | 2294 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.824 |
| Bottom | 15709 | 3.21 | 0.825 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8722.7805 | 0.2964 | -258.4851 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8757.499 | 6.3937 | 259.5139 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3929 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3929 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0798 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0798 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C6 | 2295 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.77 |
| Bottom | 12763 | 2.6 | 0.773 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7446.8296 | -1.1038 | 220.6744 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7481.5481 | 221.7032 | -2.6364 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6001 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6001 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5475 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5475 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C7 | 2296 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.833 |
| Bottom | 15709 | 3.21 | 0.836 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8818.9645 | 1.4647 | 261.3353 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8853.683 | 0.4438 | -262.3641 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6582 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.6582 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6537 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.6537 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C8 | 2297 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.785 |
| Bottom | 12763 | 2.6 | 0.787 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7593.3951 | -225.0176 | 0.4105 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7628.1136 | 226.0464 | -6.7713 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7206 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7206 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4635 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.4635 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C9 | 2298 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.687 |
| Bottom | 12763 | 2.13 | 0.691 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7506.6173 | 197.424 | 3.349 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7549.1297 | -198.5421 | -2.1895 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.0623 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.0623 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.31 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.31 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C10 | 2299 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.706 |
| Bottom | 12763 | 2.13 | 0.709 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7712.7446 | 202.8452 | 0.7451 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7755.2571 | -203.9633 | 8.5104 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9691 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.9691 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.4872 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.4872 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C11 | 2300 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.672 |
| Bottom | 12763 | 2.13 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7348.3705 | -193.2621 | 3.1579 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7390.883 | 194.3802 | -2.7238 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2255 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.2255 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.3606 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.3606 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C12 | 2301 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.683 |
| Bottom | 12763 | 2.13 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7454.9775 | -196.0659 | 1.0319 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7497.49 | 197.184 | 5.8252 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.4176 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.4176 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.232 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.232 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C1 | 2539 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.81 |
| Bottom | 7854 | 1.6 | 0.814 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6592.836 | 0.4052 | -195.3677 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6627.5545 | -196.3965 | 1.9877 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5796 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5796 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3289 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3289 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C2 | 2540 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.668 |
| Bottom | 8836 | 1.8 | 0.672 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5652.8758 | 4.7157 | -167.5136 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5687.5943 | -168.5424 | -5.0644 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.259 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.259 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4552 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.4552 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C3 | 2541 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.798 |
| Bottom | 7854 | 1.6 | 0.801 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6498.7562 | -2.3434 | 192.5798 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6521.9018 | -193.2657 | -1.2588 | 630 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3893 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.3893 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9486 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9486 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C4 | 2542 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.657 |
| Bottom | 8836 | 1.8 | 0.661 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5553.4289 | 3.8224 | 164.5666 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5588.1474 | -165.5954 | 0.5683 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9621 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9621 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2093 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.2093 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C5 | 2543 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.792 |
| Bottom | 7854 | 1.6 | 0.796 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6447.9049 | 0.6731 | -191.0729 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6482.6233 | 192.1017 | 3.7105 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7468 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7468 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8982 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.8982 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C6 | 2544 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.65 |
| Bottom | 8836 | 1.8 | 0.652 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5491.3559 | -3.144 | -162.7272 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5526.0744 | 163.756 | -6.739 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1349 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1349 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7278 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7278 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C7 | 2545 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.801 |
| Bottom | 7854 | 1.6 | 0.803 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6514.9618 | -0.1644 | 193.06 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6549.6803 | 5.1882 | -194.0889 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1023 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.1023 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.554 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.554 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C8 | 2546 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.661 |
| Bottom | 8836 | 1.8 | 0.664 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5590.2008 | -4.5735 | 165.6563 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5613.3464 | 166.3422 | -1.4131 | 630 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0062 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0062 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.0099 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.0099 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C9 | 2547 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.697 |
| Bottom | 7854 | 1.64 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5585.9809 | 146.9113 | 1.871 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5619.9909 | -147.8058 | -6.6726 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.7531 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.7531 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.2426 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.2426 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C10 | 2548 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.72 |
| Bottom | 7854 | 1.64 | 0.72 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5768.0866 | 151.7007 | -1.6889 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5779.4232 | -151.9988 | 4.2089 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.0662 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 9.0662 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.8409 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.8409 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C11 | 2549 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.674 |
| Bottom | 7854 | 1.64 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5403.3606 | 142.1084 | 0.9297 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5437.3706 | 143.0028 | -9.8213 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.9 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.5142 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.5142 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C12 | 2550 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.687 |
| Bottom | 7854 | 1.64 | 0.688 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5504.8226 | 144.7768 | -1.5406 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5538.8326 | 145.6713 | 10.6393 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.2031 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.2031 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8195 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.8195 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C1 | 2824 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.372 |
| Bottom | 3770 | 0.77 | 0.379 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2567.8163 | 5.7284 | -76.093 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2602.5348 | 0.3902 | 77.1218 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.4546 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.4546 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1047 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1047 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C2 | 2825 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.315 |
| Bottom | 3770 | 0.77 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2176.3608 | 64.4928 | -3.948 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2187.9336 | -64.8358 | 1.2309 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3739 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3739 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.1681 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.1681 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C3 | 2826 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.368 |
| Bottom | 3770 | 0.77 | 0.373 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2527.7801 | 74.9066 | -0.3239 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2562.4986 | 1.319 | -75.9354 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4712 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.4712 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8704 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8704 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C4 | 2827 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.307 |
| Bottom | 3770 | 0.77 | 0.308 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2113.3498 | 62.6256 | -2.002 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2124.9226 | -2.743 | -62.9685 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7183 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7183 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.3121 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 17.3121 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C5 | 2828 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.364 |
| Bottom | 3770 | 0.77 | 0.367 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2501.76 | 74.1355 | 0.2454 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2536.4785 | 6.0277 | 75.1643 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.428 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.428 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1511 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1511 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C6 | 2829 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.304 |
| Bottom | 3770 | 0.77 | 0.306 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2094.3855 | -1.4836 | 62.0636 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2129.104 | 63.0924 | 10.6656 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6364 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.6364 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8925 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.8925 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C7 | 2830 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.369 |
| Bottom | 3770 | 0.77 | 0.374 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2533.7267 | 0.9797 | 75.0828 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2568.4452 | -1.2479 | -76.1116 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.5601 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.5601 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3204 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3204 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C8 | 2831 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.31 |
| Bottom | 3770 | 0.77 | 0.31 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2133.517 | -63.2232 | 2.8903 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2145.0898 | 63.5662 | -5.5857 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.3712 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.3712 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.6654 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 17.6654 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C9 | 2832 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.371 |
| Bottom | 3801 | 0.79 | 0.377 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2507.2164 | 65.9398 | 4.7189 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2541.2264 | -66.8343 | -1.5835 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5813 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.5813 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.1637 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.1637 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C10 | 2833 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.411 |
| Bottom | 3801 | 0.79 | 0.412 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2773.1491 | 72.9338 | -1.844 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2784.4857 | -73.232 | 5.3152 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0979 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.0979 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.9016 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.9016 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C11 | 2834 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.331 |
| Bottom | 3801 | 0.79 | 0.335 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2237.5616 | -58.8479 | 4.1778 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2271.5716 | 59.7423 | -6.1923 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.6633 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.6633 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.9804 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.9804 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C12 | 2835 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.34 |
| Bottom | 3801 | 0.79 | 0.342 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2294.4853 | -60.345 | -1.8781 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2328.4953 | 61.2394 | 11.6496 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.9935 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.9935 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.5628 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 14.5628 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C1 | 3110 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.427 |
| Bottom | 3770 | 0.77 | 0.432 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2940.4585 | 4.2712 | -87.1356 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2975.177 | -2.647 | 88.1644 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2237 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.2237 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.928 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.928 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C2 | 3111 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.364 |
| Bottom | 3770 | 0.77 | 0.368 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2506.3079 | 74.2703 | -1.8507 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2541.0264 | -75.2991 | 6.1204 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4076 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.4076 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.4464 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.4464 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C3 | 3112 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.421 |
| Bottom | 3770 | 0.77 | 0.426 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2893.2769 | 1.655 | 85.7374 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2927.9954 | 0.8593 | -86.7663 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.0408 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.0408 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6195 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.6195 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C4 | 3113 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.354 |
| Bottom | 3770 | 0.77 | 0.356 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2436.6961 | 1.0823 | 72.2074 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2471.4146 | -73.2363 | -9.6412 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5427 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.5427 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.294 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.294 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C5 | 3114 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.416 |
| Bottom | 3770 | 0.77 | 0.419 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2864.535 | -2.234 | -84.8857 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2899.2535 | 9.5136 | 85.9145 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7863 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.7863 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9566 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9566 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C6 | 3115 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.351 |
| Bottom | 3770 | 0.77 | 0.354 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2412.6527 | 1.0482 | -71.4949 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2447.3712 | 72.5238 | 7.4905 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4983 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.4983 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2918 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2918 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C7 | 3116 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.421 |
| Bottom | 3770 | 0.77 | 0.426 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2897.6331 | -2.6208 | 85.8665 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2932.3516 | 3.7189 | -86.8954 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.828 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.828 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1606 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1606 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C8 | 3117 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.357 |
| Bottom | 3770 | 0.77 | 0.359 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2458.051 | -1.8355 | 72.8402 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2469.6238 | 73.1832 | -2.6485 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6637 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.6637 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.7971 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.7971 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C9 | 3118 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.41 |
| Bottom | 3801 | 0.79 | 0.415 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2772.5253 | 72.9174 | 4.6777 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2806.5352 | -73.8119 | -5.7806 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7672 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.7672 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7196 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.7196 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C10 | 3119 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.447 |
| Bottom | 3801 | 0.79 | 0.449 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3022.4719 | 79.491 | -3.9008 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3033.8085 | -79.7892 | 5.5016 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.6315 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 14.6315 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.4928 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.4928 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C11 | 3120 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.373 |
| Bottom | 3801 | 0.79 | 0.376 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2519.5102 | -66.2631 | 4.2126 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2553.5201 | 67.1576 | -9.2406 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.2924 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.2924 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0812 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.0812 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C12 | 3121 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.382 |
| Bottom | 3801 | 0.79 | 0.383 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2579.0109 | -67.828 | -3.4644 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2590.3476 | 68.1261 | 3.3448 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.6038 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.6038 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.3031 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.3031 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C1 | 3396 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.482 |
| Bottom | 3770 | 0.77 | 0.487 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3313.4286 | 2.261 | -98.1879 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3348.1471 | -2.1169 | 99.2168 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.8927 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.8927 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5935 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5935 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C2 | 3397 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.411 |
| Bottom | 3770 | 0.77 | 0.414 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2833.1192 | 83.9548 | -4.0284 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2867.8377 | -84.9836 | 8.4215 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7721 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7721 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.911 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.911 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C3 | 3398 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.474 |
| Bottom | 3770 | 0.77 | 0.479 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3259.7347 | 1.1543 | 96.5968 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3294.4532 | 1.1806 | -97.6256 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.469 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.469 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1926 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1926 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C4 | 3399 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.4 |
| Bottom | 3770 | 0.77 | 0.403 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2757.6584 | 81.7186 | 3.2174 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2769.2312 | -1.5738 | -82.0616 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7139 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7139 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.1337 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C5 | 3400 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.47 |
| Bottom | 3770 | 0.77 | 0.472 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3228.487 | -0.045 | -95.6708 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3263.2055 | 8.6543 | 96.6997 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.7737 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.7737 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3323 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3323 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C6 | 3401 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.396 |
| Bottom | 3770 | 0.77 | 0.399 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2728.7167 | -2.7893 | -80.861 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2763.4352 | 81.8898 | 9.5894 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0565 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0565 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2274 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.2274 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C7 | 3402 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.475 |
| Bottom | 3770 | 0.77 | 0.479 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3263.0356 | 0.5323 | 96.6946 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3297.7541 | 3.0189 | -97.7234 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.9096 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 22.9096 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1105 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1105 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C8 | 3403 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.403 |
| Bottom | 3770 | 0.77 | 0.405 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2780.0166 | -4.5335 | 82.3812 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2791.5895 | 82.7241 | -3.3633 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.065 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.065 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.1443 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.1443 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C9 | 3404 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.45 |
| Bottom | 3801 | 0.79 | 0.455 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3040.677 | 79.9698 | 2.6014 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3074.687 | -80.8643 | -4.7703 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1424 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.1424 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.9846 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.9846 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C10 | 3405 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.486 |
| Bottom | 3801 | 0.79 | 0.486 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3276.4728 | 86.1712 | -1.388 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3287.8095 | -86.4694 | 6.228 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.8051 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.8051 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.766 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 14.766 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C11 | 3406 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.415 |
| Bottom | 3801 | 0.79 | 0.418 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2801.532 | -73.6803 | 2.7104 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2835.542 | 74.5748 | -7.6863 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.6872 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.6872 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.2127 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.2127 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C12 | 3407 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.425 |
| Bottom | 3801 | 0.79 | 0.425 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2864.1147 | -75.3262 | -0.5822 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2875.4513 | 75.6244 | 4.5424 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.9292 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.9292 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.5387 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.5387 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C1 | 3682 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.536 |
| Bottom | 3770 | 0.77 | 0.541 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3685.4066 | 2.1487 | -109.2109 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3720.1251 | -2.5758 | 110.2397 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1099 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.1099 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7829 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7829 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C2 | 3683 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.459 |
| Bottom | 3770 | 0.77 | 0.462 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3157.2257 | 93.5591 | -2.446 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3191.9442 | -94.5879 | 8.5938 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0358 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.0358 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9755 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.9755 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C3 | 3684 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.528 |
| Bottom | 3770 | 0.77 | 0.533 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3625.6931 | 1.0656 | 107.4414 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3660.4116 | 0.7906 | -108.4702 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6622 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.6622 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3564 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.3564 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C4 | 3685 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.447 |
| Bottom | 3770 | 0.77 | 0.449 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3076.6406 | 91.1711 | 1.713 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3088.2134 | -2.5367 | -91.5141 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9257 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.9257 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.3122 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.3122 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C5 | 3686 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.523 |
| Bottom | 3770 | 0.77 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3592.0091 | -0.2814 | -106.4432 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3626.7276 | 8.5753 | 107.472 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.9443 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.9443 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4058 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.4058 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C6 | 3687 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.443 |
| Bottom | 3770 | 0.77 | 0.445 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3043.0267 | -1.7593 | -90.175 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3077.7452 | 91.2038 | 9.4712 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2422 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.2422 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.3861 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.3861 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C7 | 3688 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.528 |
| Bottom | 3770 | 0.77 | 0.532 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3628.3691 | 0.4492 | 107.5207 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3663.0876 | 3.0477 | -108.5495 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.7908 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.7908 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1617 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1617 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C8 | 3689 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.45 |
| Bottom | 3770 | 0.77 | 0.451 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3100.0473 | -3.4716 | 91.8647 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3111.6202 | 92.2077 | -4.5896 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.9793 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.9793 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.2515 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.2515 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C9 | 3690 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.491 |
| Bottom | 3801 | 0.79 | 0.495 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3312.1744 | 87.1102 | 3.0236 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3346.1843 | -88.0046 | -5.2413 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.6159 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.6159 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.4288 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.4288 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C10 | 3691 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.524 |
| Bottom | 3801 | 0.79 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3536.0387 | 92.9978 | -2.5602 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3547.3754 | -93.296 | 5.2115 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.0524 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 12.0524 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.9267 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.9267 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C11 | 3692 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.457 |
| Bottom | 3801 | 0.79 | 0.46 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3084.7625 | -81.1293 | 3.3103 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3118.7724 | 82.0237 | -7.8828 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.1112 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.1112 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.6437 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.6437 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C12 | 3693 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.467 |
| Bottom | 3801 | 0.79 | 0.468 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3150.8642 | -82.8677 | -1.5052 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3162.2009 | 83.1659 | 3.7661 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.158 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.158 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.837 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.837 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C1 | 3968 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.59 |
| Bottom | 3770 | 0.77 | 0.595 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4056.334 | 1.6899 | -120.2027 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4091.0525 | -2.4163 | 121.2315 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7068 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.7068 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4652 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4652 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C2 | 3969 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.488 |
| Bottom | 4561 | 0.93 | 0.491 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3478.6003 | 103.0825 | -2.2353 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3513.3188 | -104.1113 | 8.2157 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7371 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7371 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8264 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.8264 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C3 | 3970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.581 |
| Bottom | 3770 | 0.77 | 0.586 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3991.0611 | 0.7472 | 118.2684 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4025.7796 | 0.8905 | -119.2973 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2203 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.2203 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.142 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.142 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C4 | 3971 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.476 |
| Bottom | 4561 | 0.93 | 0.478 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3393.5539 | 100.5623 | 1.5069 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3405.1267 | -2.5906 | -100.9053 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5751 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5751 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2353 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.2353 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C5 | 3972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.576 |
| Bottom | 3770 | 0.77 | 0.578 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3955.0141 | -0.2491 | -117.2003 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3989.7326 | 8.0208 | 118.2291 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.5682 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.5682 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0899 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0899 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C6 | 3973 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.471 |
| Bottom | 4561 | 0.93 | 0.473 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3355.519 | -1.9998 | -99.4352 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3390.2375 | 100.464 | 8.9658 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9494 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9494 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2983 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2983 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C7 | 3974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.581 |
| Bottom | 3770 | 0.77 | 0.586 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3993.6009 | 0.58 | 118.3437 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4028.3194 | 2.5863 | -119.3725 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.1935 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.1935 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8455 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8455 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C8 | 3975 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.479 |
| Bottom | 4561 | 0.93 | 0.48 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3418.089 | -3.6709 | 101.2894 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3429.6618 | 101.6323 | -4.6031 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.447 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.447 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1516 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.1516 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C9 | 3976 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.514 |
| Bottom | 4553 | 0.95 | 0.518 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3586.7725 | 94.3321 | 2.6644 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3620.7824 | -95.2266 | -5.4098 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.5171 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.5171 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.1674 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.1674 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C10 | 3977 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.544 |
| Bottom | 4553 | 0.95 | 0.545 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3800.6282 | 99.9565 | -2.5575 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3811.9648 | -100.2547 | 4.9106 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.5693 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.5693 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.4428 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.4428 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C11 | 3978 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.482 |
| Bottom | 4553 | 0.95 | 0.486 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3369.2549 | -88.6114 | 2.9766 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3403.2649 | 89.5059 | -7.8178 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9031 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.9031 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.355 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.355 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C12 | 3979 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.493 |
| Bottom | 4553 | 0.95 | 0.494 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3439.2069 | -90.4511 | -1.4888 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3450.5436 | 90.7493 | 3.554 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.7916 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.7916 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.4689 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.4689 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C1 | 4254 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.644 |
| Bottom | 3770 | 0.77 | 0.649 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4425.8291 | 1.5929 | -131.1521 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4460.5476 | -2.3533 | 132.1809 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.4226 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.4226 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3882 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.3882 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C2 | 4255 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.533 |
| Bottom | 4561 | 0.93 | 0.536 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3797.2979 | 112.5266 | -2.2998 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3832.0164 | -113.5554 | 7.8664 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5963 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.5963 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.6659 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.6659 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C3 | 4256 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.634 |
| Bottom | 3770 | 0.77 | 0.639 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4355.4203 | 0.7038 | 129.0656 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4390.1388 | 0.853 | -130.0944 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8997 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.8997 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1438 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1438 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C4 | 4257 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.521 |
| Bottom | 4561 | 0.93 | 0.522 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3708.4121 | 109.8926 | 1.5181 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3743.1306 | -110.9214 | -10.9718 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3841 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.3841 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1555 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.1555 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C5 | 4258 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.629 |
| Bottom | 3770 | 0.77 | 0.631 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4317.0699 | -0.4571 | -127.9292 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4351.7884 | 7.6824 | 128.958 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2887 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.2887 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0147 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0147 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C6 | 4259 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.515 |
| Bottom | 4561 | 0.93 | 0.517 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3666.2127 | -2.14 | -108.6421 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3700.9312 | 109.6709 | 8.5334 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7799 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7799 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2183 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2183 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C7 | 4260 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.635 |
| Bottom | 3770 | 0.77 | 0.639 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4358.3042 | 0.4159 | 129.1511 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4393.0227 | 2.3127 | -130.1799 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.6725 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.6725 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7842 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7842 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C8 | 4261 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.524 |
| Bottom | 4561 | 0.93 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3734.1983 | -3.7682 | 110.6567 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3745.7712 | 110.9997 | -4.4421 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.0224 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.0224 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.048 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.048 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C9 | 4262 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.554 |
| Bottom | 4553 | 0.95 | 0.557 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3864.2366 | 101.6294 | 2.4708 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3898.2465 | -102.5239 | -5.4816 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.4552 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.4552 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.853 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.853 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C10 | 4263 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.583 |
| Bottom | 4553 | 0.95 | 0.584 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4069.7608 | 107.0347 | -2.6175 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4081.0974 | -107.3329 | 4.5868 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.1487 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.1487 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.8964 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.8964 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C11 | 4264 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.523 |
| Bottom | 4553 | 0.95 | 0.527 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3655.0284 | -96.1272 | 2.7804 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3689.0384 | 97.0217 | -7.7142 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7472 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.7472 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.0187 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.0187 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C12 | 4265 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.534 |
| Bottom | 4553 | 0.95 | 0.536 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3729.0703 | -98.0745 | -1.5467 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3763.0802 | 98.969 | 12.9512 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.4674 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.4674 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0549 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.0549 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C1 | 4540 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.673 |
| Bottom | 4561 | 0.93 | 0.678 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4793.5585 | 1.4723 | -142.0491 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4828.277 | -2.2936 | 143.0779 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.1061 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.1061 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2991 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2991 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C2 | 4541 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.534 |
| Bottom | 6437 | 1.31 | 0.536 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4113.3289 | 121.8916 | -2.3034 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4148.0474 | -122.9205 | 7.5418 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4332 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.4332 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5074 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.5074 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C3 | 4542 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.663 |
| Bottom | 4561 | 0.93 | 0.668 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4718.4024 | 0.5981 | 139.822 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4753.1209 | 0.7714 | -140.8508 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5465 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.5465 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1353 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1353 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C4 | 4543 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.522 |
| Bottom | 6437 | 1.31 | 0.523 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4021.1985 | 119.1615 | 1.4206 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4032.7713 | -119.5045 | -2.6218 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1714 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1714 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.0721 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.0721 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C5 | 4544 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.657 |
| Bottom | 4561 | 0.93 | 0.66 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4677.8059 | -0.5281 | -138.619 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4712.5244 | 7.4641 | 139.6478 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.9823 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.9823 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.931 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.931 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C6 | 4545 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.516 |
| Bottom | 6437 | 1.31 | 0.518 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3975.0907 | -117.7952 | -2.1344 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4009.8092 | 118.824 | 8.1803 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.593 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.593 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1412 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1412 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C7 | 4546 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.664 |
| Bottom | 4561 | 0.93 | 0.668 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4722.1182 | 0.3266 | 139.9321 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4756.8367 | 2.1528 | -140.9609 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.1141 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.1141 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7432 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7432 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C8 | 4547 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.525 |
| Bottom | 6437 | 1.31 | 0.526 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4048.3936 | -119.9674 | 3.7247 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4059.9664 | 120.3103 | -4.3091 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5716 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.5716 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.9706 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.9706 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C9 | 4548 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.587 |
| Bottom | 4828 | 1.01 | 0.59 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4144.4281 | 108.9985 | 2.3288 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4178.438 | -109.8929 | -5.4475 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3644 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.3644 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5051 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.5051 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C10 | 4549 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.615 |
| Bottom | 4828 | 1.01 | 0.616 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4343.0993 | 114.2235 | -2.5985 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4354.436 | -114.5217 | 4.3195 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.6927 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.6927 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.3126 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.3126 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C11 | 4550 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.558 |
| Bottom | 4828 | 1.01 | 0.561 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3942.1635 | -103.6789 | 2.5985 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3976.1734 | 104.5734 | -7.5501 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.5668 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.5668 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.6515 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.6515 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C12 | 4551 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.569 |
| Bottom | 4828 | 1.01 | 0.57 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4020.463 | -105.7382 | -1.5704 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4031.7997 | 106.0363 | 3.0507 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.116 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.116 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.6078 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.6078 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C1 | 4826 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.725 |
| Bottom | 4561 | 0.93 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5159.1537 | 1.3944 | -152.8829 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5193.8722 | -2.2077 | 153.9117 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6827 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.6827 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2171 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2171 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C2 | 4827 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.575 |
| Bottom | 6437 | 1.31 | 0.577 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4426.6811 | 131.1773 | -2.328 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4461.3996 | -132.2061 | 7.0384 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1836 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1836 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.3549 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.3549 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C3 | 4828 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.714 |
| Bottom | 4561 | 0.93 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5079.6076 | 0.4945 | 150.5257 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5114.3261 | 0.6754 | -151.5545 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.094 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.094 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1356 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1356 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C4 | 4829 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.563 |
| Bottom | 6437 | 1.31 | 0.564 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4331.8873 | 128.3683 | 1.3022 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4343.4602 | -128.7112 | -2.5567 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8758 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.8758 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9893 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.9893 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C5 | 4830 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.708 |
| Bottom | 4561 | 0.93 | 0.71 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5036.8229 | -0.5277 | -149.2579 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5071.5414 | 7.3219 | 150.2867 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5822 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.5822 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8517 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.8517 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C6 | 4831 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.556 |
| Bottom | 6437 | 1.31 | 0.558 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4282.123 | -126.8936 | -2.0755 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4316.8415 | 127.9224 | 7.7368 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3308 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.3308 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.0725 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.0725 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C7 | 4832 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.715 |
| Bottom | 4561 | 0.93 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5084.6633 | 0.2691 | 150.6755 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5119.3818 | 2.0891 | -151.7043 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.4455 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 19.4455 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7367 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7367 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C8 | 4833 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.566 |
| Bottom | 6437 | 1.31 | 0.567 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4360.6667 | -129.2211 | 3.5691 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4372.2395 | 129.564 | -4.129 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.0352 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.0352 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.923 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.923 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C9 | 4834 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.627 |
| Bottom | 4828 | 1.01 | 0.631 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4427.2482 | 116.4366 | 2.2445 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4461.2582 | -117.3311 | -5.3102 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.2489 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.2489 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.1006 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.1006 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C10 | 4835 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.654 |
| Bottom | 4828 | 1.01 | 0.655 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4620.3833 | 121.5161 | -2.5203 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4631.72 | -121.8142 | 4.0943 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.21 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.21 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.662 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.662 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C11 | 4836 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.599 |
| Bottom | 4828 | 1.01 | 0.602 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4230.7458 | -111.2686 | 2.4444 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4264.7558 | 112.1631 | -7.3179 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.365 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.365 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.2306 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.2306 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C12 | 4837 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.611 |
| Bottom | 4828 | 1.01 | 0.612 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4313.4251 | -113.4431 | -1.5681 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4324.7618 | 113.7412 | 2.8187 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.7413 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.7413 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.1038 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.1038 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C1 | 5112 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.717 |
| Bottom | 6437 | 1.31 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5522.2104 | 1.2765 | -163.6415 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5556.9289 | -2.3465 | 164.6703 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.2386 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.2386 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2319 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2319 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C2 | 5113 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.581 |
| Bottom | 7854 | 1.6 | 0.584 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4737.324 | 140.3827 | -2.4741 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4772.0425 | -141.4115 | 6.4197 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9311 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9311 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1217 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.1217 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C3 | 5114 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.707 |
| Bottom | 6437 | 1.31 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5438.6024 | 0.3196 | 161.1639 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5473.3209 | 0.3408 | -162.1927 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.6298 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.6298 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2261 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2261 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C4 | 5115 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.57 |
| Bottom | 7854 | 1.6 | 0.571 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4640.4476 | 137.5119 | 1.2463 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4652.0204 | -137.8549 | -2.436 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5934 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.5934 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8241 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.8241 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C5 | 5116 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.701 |
| Bottom | 6437 | 1.31 | 0.703 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5393.6912 | -0.4 | -159.833 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5428.4097 | 7.4427 | 160.8619 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1428 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.1428 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8485 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.8485 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C6 | 5117 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.563 |
| Bottom | 7854 | 1.6 | 0.565 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4587.2691 | -135.9361 | -2.0612 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4621.9876 | 136.9649 | 7.2206 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0515 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.0515 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9176 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9176 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C7 | 5118 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.708 |
| Bottom | 6437 | 1.31 | 0.712 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5445.5391 | 0.2547 | 161.3695 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5480.2576 | 2.1619 | -162.3983 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.703 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.703 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7809 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7809 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C8 | 5119 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.573 |
| Bottom | 7854 | 1.6 | 0.574 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4670.9894 | -138.417 | 3.5318 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4682.5622 | 138.7599 | -3.7894 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.4337 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7778 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.7778 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C9 | 5120 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.622 |
| Bottom | 6437 | 1.34 | 0.626 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4712.633 | 123.9422 | 2.1848 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4746.643 | -124.8367 | -5.1504 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1331 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.1331 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.5779 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.5779 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C10 | 5121 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.647 |
| Bottom | 6437 | 1.34 | 0.648 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4901.416 | 128.9072 | -2.3778 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4912.7526 | -129.2054 | 3.9136 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.6969 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 9.6969 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.8858 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.8858 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C11 | 5122 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.597 |
| Bottom | 6437 | 1.34 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4520.8641 | -118.8987 | 2.2814 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4554.8741 | 119.7932 | -7.1128 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.1728 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.1728 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6945 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.6945 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C12 | 5123 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.609 |
| Bottom | 6437 | 1.34 | 0.61 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4608.0227 | -121.191 | -1.5321 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4642.0326 | 122.0855 | 10.8552 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.3424 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.3424 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4847 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.4847 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C1 | 5398 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.764 |
| Bottom | 6437 | 1.31 | 0.769 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5882.3528 | 1.4311 | -174.3137 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5917.0713 | -1.538 | 175.3425 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6062 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.6062 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8863 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8863 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C2 | 5399 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.62 |
| Bottom | 7854 | 1.6 | 0.621 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5045.1731 | 149.5053 | -1.5122 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5079.8916 | -150.5341 | 8.6595 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6129 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.6129 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4059 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.4059 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C3 | 5400 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.753 |
| Bottom | 6437 | 1.31 | 0.758 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5794.9846 | 0.3657 | 171.7247 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5829.7031 | 0.8563 | -172.7535 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9739 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.9739 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.0156 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.0156 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C4 | 5401 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.608 |
| Bottom | 7854 | 1.6 | 0.608 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4946.8102 | 146.5905 | 0.0566 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4958.3831 | -3.196 | -146.9334 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2016 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.2016 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1035 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.1035 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C5 | 5402 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.747 |
| Bottom | 6437 | 1.31 | 0.749 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5748.0146 | -0.456 | -170.3328 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5782.7331 | 6.7423 | 171.3617 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4555 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.4555 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5118 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.5118 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C6 | 5403 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.601 |
| Bottom | 7854 | 1.6 | 0.602 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4890.4479 | -144.9203 | -1.044 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4925.1664 | 145.9491 | 9.2126 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5799 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.5799 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2362 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2362 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C7 | 5404 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.755 |
| Bottom | 6437 | 1.31 | 0.758 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5804.369 | 0.1438 | 172.0028 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5839.0875 | 1.9276 | -173.0316 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.7289 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.7289 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7141 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7141 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C8 | 5405 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.611 |
| Bottom | 7854 | 1.6 | 0.612 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4979.2871 | -147.5529 | 2.4689 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4990.8599 | 147.8958 | -5.0589 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7625 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.7625 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.2971 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 14.2971 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C9 | 5406 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.66 |
| Bottom | 6437 | 1.34 | 0.664 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5000.564 | 131.5148 | 2.1054 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5034.574 | -132.4093 | -4.9473 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9829 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.9829 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.9732 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.9732 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C10 | 5407 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.685 |
| Bottom | 6437 | 1.34 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5186.0772 | 136.3938 | -2.2057 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5197.4139 | -136.692 | 3.7173 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.1142 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 9.1142 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0398 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.0398 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C11 | 5408 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.635 |
| Bottom | 6437 | 1.34 | 0.638 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4812.6255 | -126.5721 | 2.1222 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4846.6355 | 127.4665 | -6.7439 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.8965 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.8965 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0973 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.0973 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C12 | 5409 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.648 |
| Bottom | 6437 | 1.34 | 0.649 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4904.3665 | -128.9848 | -1.4451 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4938.3765 | 129.8793 | 10.1466 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9192 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.9192 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.8 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C1 | 5684 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.766 |
| Bottom | 7854 | 1.6 | 0.771 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6238.7913 | 2.4201 | -184.8762 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6273.5098 | -0.2529 | 185.905 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4763 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.4763 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7024 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7024 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C2 | 5685 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.633 |
| Bottom | 8836 | 1.8 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5350.1241 | 158.542 | -1.348 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5384.8426 | -159.5708 | 4.3937 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2962 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2962 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4707 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.4707 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C3 | 5686 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.755 |
| Bottom | 7854 | 1.6 | 0.759 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6147.9389 | 182.1839 | 1.1996 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6182.6574 | 2.247 | -183.2127 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.809 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.809 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2472 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2472 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C4 | 5687 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.622 |
| Bottom | 8836 | 1.8 | 0.623 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5250.8913 | 155.6014 | -0.4279 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5285.6098 | -156.6302 | -8.1993 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9391 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9391 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.5078 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.5078 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C5 | 5688 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.749 |
| Bottom | 7854 | 1.6 | 0.752 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6098.9897 | -1.3687 | -180.7334 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6133.7082 | 5.2448 | 181.7622 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.428 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.428 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1883 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1883 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C6 | 5689 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.615 |
| Bottom | 8836 | 1.8 | 0.617 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5191.5712 | -1.7007 | -153.8436 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5226.2897 | 154.8724 | 6.1382 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6792 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6792 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6179 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.6179 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C7 | 5690 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.757 |
| Bottom | 7854 | 1.6 | 0.762 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6160.4862 | -0.8866 | 182.5557 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6195.2047 | 0.1555 | -183.5846 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.2704 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.2704 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3008 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.3008 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C8 | 5691 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.625 |
| Bottom | 8836 | 1.8 | 0.626 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5285.4207 | -3.8715 | 156.6246 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5296.9935 | 4.5432 | -156.9676 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9904 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9904 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.1116 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.1116 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C9 | 5692 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.66 |
| Bottom | 7854 | 1.64 | 0.664 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5291.2664 | 139.1603 | 2.528 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5325.2764 | -140.0548 | -3.4154 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.3885 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.3885 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0658 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.0658 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C10 | 5693 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.683 |
| Bottom | 7854 | 1.64 | 0.684 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5474.5153 | 143.9798 | -2.5109 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5485.852 | -144.2779 | 2.7924 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.1319 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.1319 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7249 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.7249 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C11 | 5694 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.637 |
| Bottom | 7854 | 1.64 | 0.64 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5106.3562 | -134.2972 | 2.3634 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5140.3662 | 135.1916 | -5.4985 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3638 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.3638 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.1091 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.1091 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C12 | 5695 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.649 |
| Bottom | 7854 | 1.64 | 0.651 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5202.8025 | -136.8337 | -2.0569 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5236.8124 | 137.7282 | 7.5333 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.8507 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.8507 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6842 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.6842 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C1 | 5970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.315 |
| Bottom | 3770 | 0.77 | 0.322 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2182.6686 | -6.8454 | -64.6797 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2217.3871 | 3.0294 | 65.7086 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.9026 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.9026 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9417 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9417 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C2 | 5971 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.267 |
| Bottom | 3770 | 0.77 | 0.272 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1844.6578 | 54.6634 | -4.6212 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1879.3762 | -55.6922 | 4.4688 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9708 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9708 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2773 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2773 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C3 | 5972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.311 |
| Bottom | 3770 | 0.77 | 0.316 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2145.3989 | -63.5753 | 4.5268 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2180.1174 | -3.4527 | -64.6041 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.4863 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.4863 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.369 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.369 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C4 | 5973 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.261 |
| Bottom | 3770 | 0.77 | 0.264 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1790.7018 | 53.0645 | 0.0069 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1825.4203 | -6.021 | -54.0933 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2125 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2125 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1839 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1839 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C5 | 5974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.308 |
| Bottom | 3770 | 0.77 | 0.31 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2125.8368 | 62.9956 | -4.2724 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2160.5553 | 64.0245 | 33.3691 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.9606 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 19.9606 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9262 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9262 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C6 | 5975 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.258 |
| Bottom | 3770 | 0.77 | 0.258 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1774.0229 | 52.5702 | -0.183 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1785.5957 | 52.9132 | 5.5724 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1663 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1663 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0852 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0852 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C7 | 5976 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.31 |
| Bottom | 3770 | 0.77 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2157.4054 | 63.9311 | 10.0038 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2192.1239 | 4.5916 | -64.9599 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 28.1782 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 28.1782 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1398 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.1398 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C8 | 5977 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.263 |
| Bottom | 3770 | 0.77 | 0.264 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1806.2237 | -1.0037 | 53.5244 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1840.9422 | 54.5533 | -26.8065 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.9642 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.9642 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7425 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.7425 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C9 | 5978 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.417 |
| Bottom | 4023 | 1.12 | 0.423 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2269.8026 | 59.6958 | 3.3374 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2295.3101 | -60.3667 | -1.5283 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8269 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8269 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.6291 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 9.6291 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C10 | 5979 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.472 |
| Bottom | 4023 | 1.12 | 0.474 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2566.797 | 67.5068 | -2.5377 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2575.2995 | 0.5289 | 67.7304 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.3242 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 13.3242 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.2432 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 15.2432 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C11 | 5980 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.364 |
| Bottom | 4023 | 1.12 | 0.368 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1984.741 | -52.1987 | 2.9385 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1993.2435 | -52.4223 | -0.052 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.9065 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.9065 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.3446 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.3446 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C12 | 5981 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.376 |
| Bottom | 4023 | 1.12 | 0.378 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2045.8299 | -53.8053 | -1.7134 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2054.3324 | 0.5149 | 54.0289 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.2723 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 9.2723 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.8342 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.8342 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C13 | 6210 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.412 |
| Bottom | 2514 | 1.05 | 0.412 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1412.037 | -28.2407 | 31.5106 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1416.8056 | 28.3361 | 22.9401 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.316 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.316 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.7886 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.7886 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C14 | 6212 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.21 |
| Bottom | 2514 | 1.05 | 0.219 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 731.8025 | -14.6361 | 3.6506 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 746.3782 | -15.1381 | -23.9339 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.3795 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.3795 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.825 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.825 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C15 | 6215 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.29 |
| Bottom | 2514 | 1.05 | 0.292 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 995.0646 | -19.9013 | 21.6641 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1004.6018 | -20.092 | 12.1512 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.0779 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 9.0779 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.4127 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.4127 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C16 | 6217 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.29 |
| Bottom | 2514 | 1.05 | 0.295 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 994.266 | 19.8853 | 20.6944 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1008.5717 | 20.3626 | 32.2407 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.3856 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 8.3856 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.6843 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.6843 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C18 | 6219 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.207 |
| Bottom | 2514 | 1.05 | 0.218 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 722.8314 | -14.4566 | -3.611 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 737.4071 | -15.8345 | -23.6462 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.2606 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 1.2606 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.9949 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.9949 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C17 | 6222 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.332 |
| Bottom | 2514 | 1.05 | 0.35 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1141.0289 | -22.8206 | 18.9087 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1160.1033 | 27.3465 | -37.0846 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.4382 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.4382 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.0998 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 14.0998 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C20 | 6225 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.411 |
| Bottom | 2514 | 1.05 | 0.411 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1409.8425 | 28.1968 | 27.9477 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1414.6111 | 28.2922 | 20.063 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.9086 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.9086 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.0845 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.0845 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C19 | 6227 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.341 |
| Bottom | 2514 | 1.05 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1171.6047 | 23.4321 | 17.8945 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1190.679 | -23.0821 | -38.062 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.7324 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.7324 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.1609 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.1609 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C21 | 6230 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.416 |
| Bottom | 2514 | 1.05 | 0.416 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1427.132 | -28.5426 | -26.6397 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1431.9006 | -28.638 | -18.5245 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.0413 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.0413 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.8147 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.8147 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C22 | 6232 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.205 |
| Bottom | 2514 | 1.05 | 0.22 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 712.5625 | 14.2513 | 4.6066 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 727.1382 | 17.545 | 23.3169 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.7446 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 1.7446 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.3167 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.3167 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C23 | 6235 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.287 |
| Bottom | 2514 | 1.05 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 985.8675 | -19.7174 | -18.613 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1000.1733 | -18.6291 | -31.9722 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.1238 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 8.1238 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.8712 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.8712 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C24 | 6237 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.229 |
| Bottom | 2514 | 1.05 | 0.237 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 793.4546 | 15.8691 | -5.4032 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 808.0303 | 16.3272 | -25.9108 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.3054 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.3054 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.9395 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.9395 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C25 | 6241 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.295 |
| Bottom | 2514 | 1.05 | 0.296 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1012.1265 | 20.2425 | -17.0624 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1021.6636 | 20.4333 | -9.6159 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.9252 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.9252 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0883 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.0883 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C26 | 6243 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.409 |
| Bottom | 2514 | 1.05 | 0.409 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1403.4263 | 28.0685 | -26.9795 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1408.1949 | -28.1639 | -19.2682 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.4005 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.4005 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.3035 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.3035 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C27 | 6258 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.329 |
| Bottom | 2514 | 1.05 | 0.338 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1126.8681 | 22.5374 | -23.1144 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1150.711 | -23.6893 | 36.7844 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.831 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.831 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.4844 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.4844 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C28 | 6262 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.333 |
| Bottom | 2514 | 1.05 | 0.345 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1142.9457 | -22.8589 | -23.4394 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1166.7886 | 25.0178 | 37.2983 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.8737 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.8737 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.8984 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.8984 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C29 | 6266 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.314 |
| Bottom | 2514 | 1.05 | 0.337 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1082.8017 | 21.656 | 13.5814 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1097.1075 | 28.4021 | 35.0709 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.9131 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 1.9131 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.8774 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 14.8774 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C30 | 6268 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.317 |
| Bottom | 2514 | 1.05 | 0.335 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1093.8724 | -21.8774 | 13.2689 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1108.1781 | -26.3458 | 35.4248 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.5834 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.5834 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.955 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.955 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C31 | 6270 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.347 |
| Bottom | 2514 | 1.05 | 0.371 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1196.9724 | 23.9394 | -12.3989 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1211.2782 | 30.925 | -38.7205 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.9056 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.9056 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.0519 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 16.0519 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C32 | 6272 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.338 |
| Bottom | 2514 | 1.05 | 0.351 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1166.1992 | -23.324 | -14.0703 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1180.505 | -25.9203 | -37.7368 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.2835 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.2835 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.8482 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.8482 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C33 | 6274 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.462 |
| Bottom | 3770 | 1.26 | 0.484 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2067.7749 | 41.3555 | -56.1172 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 2097.5786 | -49.2587 | 81.0365 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.3499 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 30.3499 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 26.7875 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 26.7875 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C35 | 6280 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.395 |
| Bottom | 3770 | 1.26 | 0.403 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1763.6365 | -35.2727 | -50.3988 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1793.4402 | 36.1735 | 69.2866 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.9119 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 24.9119 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 18.1884 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 18.1884 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C34 | 6282 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.361 |
| Bottom | 3770 | 1.26 | 0.378 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1619.5436 | 32.3909 | 32.6618 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1643.3866 | -37.8495 | -63.4895 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.673 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 21.673 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 19.4121 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 19.4121 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C36 | 6286 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.379 |
| Bottom | 3770 | 1.26 | 0.393 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1698.9213 | -33.9784 | 36.3242 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1722.7642 | 38.169 | -66.5561 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.139 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 24.139 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 19.4388 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 19.4388 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C37 | 6290 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.453 |
| Bottom | 2514 | 1.05 | 0.454 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1561.3636 | -31.2273 | 19.6606 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1570.9007 | -31.418 | 13.3087 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.1657 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.1657 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.3902 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.3902 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C38 | 6293 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.466 |
| Bottom | 2514 | 1.05 | 0.466 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1605.9972 | 32.1199 | 19.9373 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1610.7658 | 32.2153 | 16.288 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0017 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.0017 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.0144 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.0144 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C39 | 6296 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.213 |
| Bottom | 5182 | 0.93 | 0.216 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1708.4419 | -34.1688 | -4.6432 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1741.8221 | -34.8364 | -11.0094 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.8806 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 3.8806 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 18.4544 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 18.4544 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C40 | 6298 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.227 |
| Bottom | 5182 | 0.93 | 0.236 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1824.4638 | 36.4893 | -3.9721 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1857.8439 | 47.3987 | -96.546 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.5773 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.5773 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.4921 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 23.4921 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C41 | 6300 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.21 |
| Bottom | 5182 | 0.93 | 0.213 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1686.8682 | -33.7374 | 3.7341 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1720.2483 | -34.405 | 10.4985 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.333 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.333 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 18.563 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 18.563 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C42 | 6302 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.215 |
| Bottom | 5182 | 0.93 | 0.223 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1729.7313 | 34.5946 | 3.2037 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1763.1115 | 42.3521 | 91.623 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.4587 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.4587 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 21.4968 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 21.4968 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C43 | 6304 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.607 |
| Bottom | 2514 | 1.05 | 0.608 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2103.4868 | -42.0697 | -17.1701 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 2108.2554 | -42.1651 | -14.6102 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.545 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.545 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.7565 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.7565 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C44 | 6306 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.466 |
| Bottom | 2514 | 1.05 | 0.466 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1606.8934 | 32.1379 | -19.1918 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1611.662 | 32.2332 | -15.2962 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.2047 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.2047 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.1714 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.1714 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C1 | 6325 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.109 |
| Bottom | 3770 | 0.77 | 0.116 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 724.1513 | -21.459 | -33.4005 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 782.0155 | 25.0976 | 29.7629 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.1282 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.1282 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.694 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.694 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C2 | 6326 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.113 |
| Bottom | 3770 | 0.77 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 785.2361 | 23.2692 | -3.8771 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 819.9546 | -12.1535 | 24.298 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0737 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0737 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9176 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.9176 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C3 | 6327 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.11 |
| Bottom | 3770 | 0.77 | 0.115 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 709.6215 | -21.0285 | 38.2019 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 767.4857 | 24.393 | -32.1983 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.2727 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 22.2727 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.3798 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.3798 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C4 | 6328 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.109 |
| Bottom | 3770 | 0.77 | 0.114 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 760.9111 | 5.427 | 22.5483 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 795.6296 | -23.5772 | -13.2285 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1125 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.1125 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1559 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1559 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C5 | 6329 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.108 |
| Bottom | 3770 | 0.77 | 0.113 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 703.1986 | 20.8381 | -35.6084 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 761.0627 | -22.5528 | 31.1156 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.191 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.191 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8453 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.8453 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C6 | 6330 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.109 |
| Bottom | 3770 | 0.77 | 0.114 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 752.9596 | 1.3114 | -22.3127 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 787.6781 | 18.8625 | 23.3415 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.7693 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.7693 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1568 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1568 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C7 | 6331 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.119 |
| Bottom | 3770 | 0.77 | 0.123 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 724.8339 | 29.2323 | 49.5947 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 782.698 | -29.9651 | -42.804 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 29.3194 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 29.3194 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.8747 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.8747 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C8 | 6332 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.111 |
| Bottom | 3770 | 0.77 | 0.116 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 763.1724 | 0.919 | 22.6153 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 797.8909 | 23.6442 | -23.4174 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.686 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.686 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.157 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.157 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C9 | 6333 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.287 |
| Bottom | 3218 | 0.89 | 0.292 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1489.3039 | 39.1687 | 2.3465 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1514.8113 | -39.8395 | -0.9421 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.9863 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.9863 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.6323 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 14.6323 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C10 | 6334 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.369 |
| Bottom | 3218 | 0.89 | 0.372 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1916.381 | 50.4008 | -2.119 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1941.8885 | -36.6702 | 51.0717 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.2095 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 13.2095 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 24.8273 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 24.8273 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C11 | 6335 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.224 |
| Bottom | 3218 | 0.89 | 0.227 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1138.109 | -40.9982 | 29.9323 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1180.6214 | 26.218 | -31.0503 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.0163 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.0163 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 21.2816 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 21.2816 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C12 | 6336 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.239 |
| Bottom | 3218 | 0.89 | 0.244 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1244.7347 | -32.7365 | -2.6408 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1270.2422 | 27.2831 | 33.4074 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.0216 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.0216 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.1172 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 20.1172 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C13 | 6565 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.197 |
| Bottom | 2060 | 0.86 | 0.262 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 535.2803 | -18.7664 | 38.2786 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 559.1233 | 29.6098 | -64.1121 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.7333 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 38.7333 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.183 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.183 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C14 | 6567 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.084 |
| Bottom | 2060 | 0.86 | 0.09 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 277.4346 | 5.5487 | -5.2685 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 292.0103 | 5.8402 | -10.2985 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.073 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.073 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2884 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2884 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C15 | 6570 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.144 |
| Bottom | 2060 | 0.86 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 398.6923 | 9.576 | 36.6931 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 422.5353 | -13.6329 | -43.3144 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.2567 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 30.2567 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8008 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.8008 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C16 | 6572 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.132 |
| Bottom | 2060 | 0.86 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 380.2814 | -10.9139 | 25.739 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 404.1244 | 15.1113 | -43.2814 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.0891 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 26.0891 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7674 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.7674 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C18 | 6574 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.083 |
| Bottom | 2060 | 0.86 | 0.087 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 272.063 | 5.4413 | 4.4203 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 286.6387 | 5.7328 | 5.3366 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.6015 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0.6015 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1527 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1527 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C17 | 6577 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.148 |
| Bottom | 2060 | 0.86 | 0.158 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 428.0192 | -8.5604 | 36.893 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 451.8622 | 13.4649 | -30.4002 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.4739 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.4739 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.084 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.084 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C20 | 6580 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.192 |
| Bottom | 2060 | 0.86 | 0.258 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 537.5237 | 18.6906 | 31.1399 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 561.3666 | -29.2921 | -61.8269 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 35.1129 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 35.1129 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.1675 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.1675 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C19 | 6582 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.149 |
| Bottom | 2060 | 0.86 | 0.158 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 438.9054 | 8.7781 | 35.1321 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 462.7484 | -10.9671 | -33.7345 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.017 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 26.017 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.5818 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.5818 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C21 | 6585 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.192 |
| Bottom | 2060 | 0.86 | 0.271 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 545.3808 | -18.3653 | -31.0436 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 569.2237 | 28.8653 | 71.1368 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.4284 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 38.4284 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 17.8209 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 17.8209 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C22 | 6587 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.083 |
| Bottom | 2060 | 0.86 | 0.088 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 273.1108 | 5.4622 | -4.2106 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 287.6865 | 5.7537 | -8.0473 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.3713 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.3713 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1004 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1004 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C23 | 6590 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.127 |
| Bottom | 2060 | 0.86 | 0.173 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 381.6318 | 9.9679 | -21.8728 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 405.4748 | -14.0331 | 51.2545 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.525 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.525 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.0499 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.0499 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C24 | 6592 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.096 |
| Bottom | 2060 | 0.86 | 0.103 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 314.3068 | 6.2861 | 7.9058 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 328.8825 | 6.5776 | 14.8363 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.2808 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.2808 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0429 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0429 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C25 | 6596 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.141 |
| Bottom | 2060 | 0.86 | 0.17 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 428.7995 | -9.0578 | -27.9535 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 452.6424 | 12.4348 | 44.5227 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.2943 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.2943 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.1047 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.1047 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C26 | 6598 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.183 |
| Bottom | 2060 | 0.86 | 0.254 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 549.9141 | 14.8091 | -28.6325 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 573.757 | -25.8594 | 65.4036 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 35.4211 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 35.4211 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.3444 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 15.3444 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C27 | 6600 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.144 |
| Bottom | 2060 | 0.86 | 0.16 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 431.1857 | 8.6237 | -31.721 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 455.0287 | -12.1429 | 35.4478 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.3003 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.3003 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.1532 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.1532 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C28 | 6604 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.147 |
| Bottom | 2060 | 0.86 | 0.165 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 436.8147 | -8.7363 | -33.7172 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 460.6577 | 11.2826 | 41.472 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.2727 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 28.2727 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.7526 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.7526 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C29 | 6608 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.125 |
| Bottom | 2060 | 0.86 | 0.148 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 399.7037 | -9.2146 | 12.7772 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 423.5466 | 14.3771 | -20.417 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 12.0693 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 12.0693 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8824 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.8824 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C30 | 6610 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.126 |
| Bottom | 2060 | 0.86 | 0.151 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 405.0316 | 8.816 | 14.0718 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 428.8745 | -14.052 | -27.0286 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.5486 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.5486 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.6386 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.6386 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C31 | 6612 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.139 |
| Bottom | 2060 | 0.86 | 0.177 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 441.7831 | -10.1372 | -14.3137 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 465.6261 | 15.9473 | 38.8927 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.9896 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.9896 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7992 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.7992 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C32 | 6614 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.133 |
| Bottom | 2060 | 0.86 | 0.165 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 437.8052 | -8.7561 | 4.7682 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 452.111 | -13.6943 | 36.1901 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.732 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.732 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4273 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.4273 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C33 | 6616 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.361 |
| Bottom | 3142 | 1.05 | 0.376 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1539.4495 | 30.789 | -53.296 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1569.2532 | -31.3851 | 88.5137 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.2497 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 53.2497 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 19.4825 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 19.4825 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C35 | 6622 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.289 |
| Bottom | 3142 | 1.05 | 0.305 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1232.4073 | -24.6481 | -41.0222 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1262.211 | 25.2442 | 77.2499 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.4741 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 44.4741 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.2249 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 10.2249 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C34 | 6624 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.248 |
| Bottom | 3142 | 1.05 | 0.256 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1061.3939 | 21.2279 | 21.1091 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1085.2368 | -21.7047 | -45.3279 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.5112 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 31.5112 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.3892 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 11.3892 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C36 | 6628 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.279 |
| Bottom | 3142 | 1.05 | 0.29 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1196.1356 | -23.9227 | 25.2895 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1219.9786 | 24.3996 | -60.2448 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.4847 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 40.4847 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.2832 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 11.2832 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C37 | 6632 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.166 |
| Bottom | 2060 | 0.86 | 0.182 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 548.9218 | -10.9784 | -4.7885 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 563.2275 | -12.4037 | -30.2706 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.1327 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.1327 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.648 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.648 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C38 | 6635 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.172 |
| Bottom | 2060 | 0.86 | 0.191 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 566.3195 | 11.3264 | -5.9467 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 580.6253 | 12.5308 | -36.3487 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.1876 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.1876 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.796 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.796 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C39 | 6638 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.097 |
| Bottom | 4553 | 0.81 | 0.104 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 765.9023 | 15.318 | 7.8755 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 799.2825 | -19.3523 | 41.536 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.162 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.162 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.9398 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 13.9398 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C40 | 6640 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.107 |
| Bottom | 4553 | 0.81 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 842.8411 | 16.8568 | 7.8046 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 876.2212 | 26.2488 | 45.5343 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 2.2236 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 2.2236 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 14.8956 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 14.8956 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C41 | 6642 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.097 |
| Bottom | 4553 | 0.81 | 0.104 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 757.2826 | 15.1457 | -2.4206 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 790.6628 | -20.4074 | -41.0881 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 2.8591 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 2.8591 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.8802 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 13.8802 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C42 | 6644 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.1 |
| Bottom | 4553 | 0.81 | 0.109 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 782.3305 | 15.6466 | -2.3593 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 815.7106 | 23.5416 | -42.3898 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.7687 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 3.7687 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 14.1434 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 14.1434 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C43 | 6646 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.354 |
| Bottom | 2060 | 0.86 | 0.364 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1160.8094 | 23.2162 | -28.1285 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1184.6524 | -23.693 | 42.5417 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.4544 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 26.4544 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8008 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.8008 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C44 | 6648 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.175 |
| Bottom | 2060 | 0.86 | 0.199 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 576.5784 | 11.5316 | 9.4129 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 590.8842 | 13.0079 | 42.3109 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.6375 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.6375 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0243 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.0243 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C1 | 6667 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.178 |
| Bottom | 3770 | 0.77 | 0.183 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1226.7459 | -1.5313 | -36.3526 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1261.4644 | 37.3814 | 30.4637 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.8128 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 19.8128 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.8695 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.8695 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C2 | 6668 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.165 |
| Bottom | 3770 | 0.77 | 0.168 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1141.037 | 33.8127 | -2.47 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1152.6098 | 0.2975 | 34.1557 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7745 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7745 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4772 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.4772 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C3 | 6669 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.174 |
| Bottom | 3770 | 0.77 | 0.18 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1203.9005 | -2.7989 | 35.6756 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1238.619 | 36.7044 | -33.1401 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.8769 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.8769 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7418 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.7418 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C4 | 6670 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.16 |
| Bottom | 3770 | 0.77 | 0.163 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1105.7863 | 32.7681 | 2.7162 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1140.5048 | -33.797 | -14.4278 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9487 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9487 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2552 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.2552 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C5 | 6671 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.172 |
| Bottom | 3770 | 0.77 | 0.178 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1193.1698 | 35.3576 | -4.7321 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1227.8883 | -36.3864 | 30.7037 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.7639 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.7639 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6072 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.6072 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C6 | 6672 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.159 |
| Bottom | 3770 | 0.77 | 0.162 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1094.442 | 32.432 | -1.0244 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1129.1605 | 17.0171 | 33.4608 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4289 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.4289 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7828 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7828 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C7 | 6673 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.177 |
| Bottom | 3770 | 0.77 | 0.184 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1194.839 | 35.7814 | 47.2505 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1252.7032 | -37.1218 | -43.6492 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 28.8214 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 28.8214 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.0281 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.0281 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C8 | 6674 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.161 |
| Bottom | 3770 | 0.77 | 0.166 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1112.6949 | -1.9658 | 32.9729 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1147.4134 | 34.0017 | -24.4554 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.5565 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.5565 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8417 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.8417 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C9 | 6675 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.335 |
| Bottom | 3218 | 0.89 | 0.34 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1741.4118 | 45.7991 | 2.8633 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1766.9193 | -46.47 | -2.1206 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8911 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8911 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.0123 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 14.0123 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C10 | 6676 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.408 |
| Bottom | 3218 | 0.89 | 0.408 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2115.1412 | 55.6282 | -2.1887 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2140.6487 | -33.4356 | 56.2991 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.0489 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 13.0489 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 21.1393 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 21.1393 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C11 | 6677 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.274 |
| Bottom | 3218 | 0.89 | 0.278 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1427.1245 | -37.5334 | 2.6946 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1435.627 | 37.757 | -0.2246 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.7811 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.7811 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.3269 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 13.3269 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C12 | 6678 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.29 |
| Bottom | 3218 | 0.89 | 0.292 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1503.9623 | -39.5542 | -1.1587 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1529.4698 | 24.8479 | 40.2251 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.6612 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.6612 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.4043 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 15.4043 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C13 | 6907 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.275 |
| Bottom | 2060 | 0.86 | 0.314 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 823.6708 | -20.7891 | 48.9229 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 847.5137 | 29.0874 | -64.1465 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.8026 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 42.8026 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.7064 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.7064 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C14 | 6909 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.129 |
| Bottom | 2060 | 0.86 | 0.135 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 429.5713 | 8.5914 | -0.411 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 444.147 | 8.8829 | -11.8042 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.9861 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.9861 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1893 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1893 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C15 | 6912 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.19 |
| Bottom | 2060 | 0.86 | 0.208 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 592.5285 | 11.8506 | 33.2521 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 616.3715 | -14.0225 | -43.3957 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.0085 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 29.0085 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.0224 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.0224 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C16 | 6914 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.187 |
| Bottom | 2060 | 0.86 | 0.209 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 580.4971 | -11.6099 | 33.3404 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 604.34 | 15.6681 | -43.944 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.2244 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 29.2244 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.8481 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.8481 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C18 | 6916 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.127 |
| Bottom | 2060 | 0.86 | 0.133 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 422.9619 | 8.4592 | 0.4578 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 437.5376 | -8.7508 | 5.0716 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.9059 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.9059 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.179 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.179 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C17 | 6919 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.203 |
| Bottom | 2060 | 0.86 | 0.215 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 668.569 | -13.3714 | 10.8491 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 687.6433 | 14.7183 | -27.2619 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.0899 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 18.0899 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.1611 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.1611 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C20 | 6922 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.272 |
| Bottom | 2060 | 0.86 | 0.31 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 824.7724 | 20.6741 | 44.6629 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 848.6153 | -28.6122 | -61.3279 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.0445 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 40.0445 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.683 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.683 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C19 | 6924 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.209 |
| Bottom | 2060 | 0.86 | 0.219 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 686.034 | 13.7207 | 10.1106 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 705.1083 | -14.1022 | -30.0905 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.006 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.006 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6738 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.6738 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C21 | 6927 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.273 |
| Bottom | 2060 | 0.86 | 0.32 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 836.1839 | -20.6758 | -42.7551 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 860.0269 | 28.3461 | 68.8074 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.9288 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 41.9288 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.4827 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.4827 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C22 | 6929 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.126 |
| Bottom | 2060 | 0.86 | 0.132 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 420.2803 | 8.4056 | -0.0233 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 434.856 | 8.6971 | -7.9217 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.8816 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.8816 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0292 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0292 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C23 | 6932 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.184 |
| Bottom | 2060 | 0.86 | 0.211 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 579.306 | 11.5861 | -30.1977 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 603.149 | -14.559 | 49.5243 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.9937 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 29.9937 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.2019 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.2019 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C24 | 6934 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.142 |
| Bottom | 2060 | 0.86 | 0.15 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 474.8969 | 9.4979 | 1.3902 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 489.4726 | 9.7895 | 15.5786 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.7692 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 8.7692 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.074 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.074 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C25 | 6938 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.193 |
| Bottom | 2060 | 0.86 | 0.212 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 619.0451 | -12.3809 | -26.8795 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 642.888 | 13.054 | 42.7961 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.2215 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 26.2215 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4272 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.4272 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C26 | 6940 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.268 |
| Bottom | 2060 | 0.86 | 0.307 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 831.0945 | 18.7455 | -42.8511 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 854.9375 | -26.0641 | 63.8187 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.1722 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 40.1722 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.9032 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 16.9032 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C27 | 6942 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.202 |
| Bottom | 2060 | 0.86 | 0.214 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 668.0574 | 13.3611 | -7.4122 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 687.1317 | -13.7426 | 30.423 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.7864 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.7864 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.3379 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.3379 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C28 | 6946 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.205 |
| Bottom | 2060 | 0.86 | 0.221 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 682.2711 | -13.6454 | 3.9584 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 696.5769 | 13.9315 | 35.6125 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.7796 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.7796 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0253 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.0253 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C29 | 6950 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.192 |
| Bottom | 2060 | 0.86 | 0.206 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 623.5695 | -12.4714 | 22.745 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 647.4124 | 15.6169 | -23.0221 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.3897 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.3897 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.8044 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.8044 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C30 | 6952 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.194 |
| Bottom | 2060 | 0.86 | 0.208 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 631.4315 | 12.6286 | 23.2737 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 655.2745 | -15.0063 | -28.6783 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.6574 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.6574 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.3735 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.3735 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C31 | 6954 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.212 |
| Bottom | 2060 | 0.86 | 0.234 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 691.7955 | -13.8359 | -24.0582 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 715.6384 | 17.1095 | 38.101 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.3322 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 23.3322 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.7002 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.7002 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C32 | 6956 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.207 |
| Bottom | 2060 | 0.86 | 0.222 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 671.5665 | 13.4313 | -24.8651 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 695.4095 | -14.6568 | 35.9312 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.8933 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 22.8933 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.2349 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.2349 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C33 | 6958 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.402 |
| Bottom | 3142 | 1.05 | 0.414 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1712.9421 | 34.2588 | -51.8595 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1742.7458 | -34.8549 | 86.2893 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.8688 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 51.8688 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 19.5287 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 19.5287 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C35 | 6964 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.33 |
| Bottom | 3142 | 1.05 | 0.343 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1405.8374 | -28.1167 | -47.8507 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1435.6411 | 28.7128 | 75.4941 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.3848 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 46.3848 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.99 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 10.99 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C34 | 6966 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.291 |
| Bottom | 3142 | 1.05 | 0.298 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1239.314 | 24.7863 | 40.7271 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1269.1177 | -25.3824 | -47.3479 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 33.4153 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 33.4153 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 12.083 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 12.083 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C36 | 6970 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.318 |
| Bottom | 3142 | 1.05 | 0.327 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1354.2122 | -27.0842 | 46.684 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1384.0159 | 27.6803 | -59.9503 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.3809 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 40.3809 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.9727 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 11.9727 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C37 | 6974 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.269 |
| Bottom | 2060 | 0.86 | 0.277 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 875.7713 | 17.5154 | 30.6574 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 899.6142 | -17.9923 | -33.7816 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.4566 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 24.4566 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5393 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.5393 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C38 | 6977 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.277 |
| Bottom | 2060 | 0.86 | 0.288 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 902.4103 | -18.0482 | 32.3149 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 926.2532 | 18.5251 | -39.3208 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.1157 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.1157 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7908 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.7908 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C39 | 6980 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.138 |
| Bottom | 4553 | 0.81 | 0.141 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1082.5342 | 21.6507 | 5.6918 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1115.9144 | -22.3183 | 14.8327 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 5.8156 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 5.8156 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.2672 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 13.2672 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C40 | 6982 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.15 |
| Bottom | 4553 | 0.81 | 0.156 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1174.3027 | 23.4861 | 5.1675 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1207.6828 | 27.2518 | 62.7593 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.4466 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.4466 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 16.1089 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 16.1089 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C41 | 6984 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.137 |
| Bottom | 4553 | 0.81 | 0.14 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1069.0709 | 21.3814 | -0.9741 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1102.4511 | -20.8501 | -57.2907 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.7257 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 6.7257 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.5904 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 13.5904 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C42 | 6986 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.14 |
| Bottom | 4553 | 0.81 | 0.145 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1100.2518 | 22.005 | -1.5965 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1133.6319 | 23.9217 | -58.9111 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.3347 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 7.3347 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 14.3136 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 14.3136 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C43 | 6988 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.447 |
| Bottom | 2060 | 0.86 | 0.455 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1468.415 | 29.3683 | -22.9296 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1492.258 | -29.8452 | 39.0927 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.163 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 23.163 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.2915 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.2915 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C44 | 6990 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.279 |
| Bottom | 2060 | 0.86 | 0.293 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 909.8436 | -18.1969 | -31.0254 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 933.6866 | 18.6737 | 44.0028 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.2218 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 28.2218 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.052 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.052 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C1 | 7009 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.248 |
| Bottom | 3770 | 0.77 | 0.251 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1704.988 | 0.8069 | -50.5245 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1739.7065 | 31.3802 | 51.5533 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.4522 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 19.4522 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.9418 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.9418 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C2 | 7010 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.217 |
| Bottom | 3770 | 0.77 | 0.219 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1493.8839 | 44.2688 | -2.3087 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1528.6024 | -45.2976 | 9.626 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4581 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.4581 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9286 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.9286 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C3 | 7011 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.244 |
| Bottom | 3770 | 0.77 | 0.247 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1674.5511 | -0.7833 | 49.6225 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1709.2696 | 50.6514 | -33.9512 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.7155 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 20.7155 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.1717 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.1717 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C4 | 7012 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.21 |
| Bottom | 3770 | 0.77 | 0.212 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1448.6984 | 42.9298 | 1.7072 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1460.2712 | -2.4429 | -43.2727 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.7976 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.7976 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0477 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.0477 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C5 | 7013 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.24 |
| Bottom | 3770 | 0.77 | 0.244 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1659.4511 | 4.69 | -49.1751 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1694.1696 | -50.2039 | 29.3132 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.346 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 18.346 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.4036 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.4036 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C6 | 7014 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.208 |
| Bottom | 3770 | 0.77 | 0.21 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1434.5856 | 1.4046 | -42.5116 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1469.3041 | 17.1006 | 43.5404 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0737 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0737 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.12 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.12 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C7 | 7015 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.244 |
| Bottom | 3770 | 0.77 | 0.25 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1687.5353 | 5.7805 | 50.0073 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1722.2538 | -51.0361 | -44.029 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 28.6335 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 28.6335 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 24.4857 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 24.4857 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C8 | 7016 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.212 |
| Bottom | 3770 | 0.77 | 0.215 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1460.1676 | -1.2945 | 43.2696 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1494.8861 | 44.2985 | -24.5264 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.3327 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 16.3327 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.3105 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.3105 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C9 | 7017 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.368 |
| Bottom | 4023 | 1.12 | 0.372 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2001.2074 | 52.6318 | 2.576 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2026.7149 | -53.3026 | -2.8502 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.131 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.131 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.0222 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 15.0222 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C10 | 7018 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.429 |
| Bottom | 4023 | 1.12 | 0.428 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2332.1506 | 61.3356 | -2.6665 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2340.6531 | -61.5592 | 5.2545 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.2319 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 12.2319 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.2837 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.2837 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C11 | 7019 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.312 |
| Bottom | 4023 | 1.12 | 0.316 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1703.1863 | -44.7938 | 2.7171 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1711.6888 | 45.0174 | -0.1253 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.6702 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.6702 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.7097 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 15.7097 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C12 | 7020 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.325 |
| Bottom | 4023 | 1.12 | 0.326 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1770.7823 | -46.5716 | -2.0287 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1779.2848 | 46.7952 | 3.2521 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.1932 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.1932 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 16.9524 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 16.9524 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C13 | 7249 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.332 |
| Bottom | 2514 | 1.05 | 0.384 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1112.9916 | -22.2598 | 48.5727 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1136.8345 | 34.3097 | -80.0544 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.7107 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 48.7107 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 20.6105 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 20.6105 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C14 | 7251 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.167 |
| Bottom | 2514 | 1.05 | 0.173 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 581.1207 | 11.6224 | -0.966 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 595.6964 | 11.9139 | -9.974 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.504 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.504 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6852 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.6852 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C15 | 7254 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.234 |
| Bottom | 2514 | 1.05 | 0.258 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 788.35 | 15.767 | 33.2626 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 812.193 | -16.2439 | -57.8336 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 34.4847 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 34.4847 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7165 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.7165 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C16 | 7256 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.232 |
| Bottom | 2514 | 1.05 | 0.257 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 782.2778 | -15.6456 | 32.3392 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 806.1208 | 16.1224 | -58.6228 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 34.4068 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 34.4068 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.312 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.312 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C18 | 7258 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.165 |
| Bottom | 2514 | 1.05 | 0.169 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 573.2494 | 11.465 | -0.8886 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 587.8251 | 11.7565 | 1.2859 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.4204 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 1.4204 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.7516 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.7516 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C17 | 7261 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.263 |
| Bottom | 2514 | 1.05 | 0.27 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 903.8786 | -18.0776 | 13.2891 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 922.9529 | 18.4591 | -28.1708 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.6914 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.6914 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3959 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.3959 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C20 | 7264 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.329 |
| Bottom | 2514 | 1.05 | 0.38 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1112.5698 | 22.2514 | 43.9394 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1136.4128 | -34.2127 | -75.9232 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.2977 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 45.2977 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 20.8226 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 20.8226 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C19 | 7266 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.27 |
| Bottom | 2514 | 1.05 | 0.277 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 923.2129 | 18.4643 | 23.0782 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 947.0558 | -18.9411 | -31.6242 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.6939 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.6939 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.1219 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.1219 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C21 | 7269 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.332 |
| Bottom | 2514 | 1.05 | 0.388 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1127.0909 | -22.5418 | -42.3918 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1150.9339 | 34.0905 | 82.0838 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.777 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 46.777 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 20.5922 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 20.5922 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C22 | 7271 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.163 |
| Bottom | 2514 | 1.05 | 0.168 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 566.8202 | -11.3364 | 0.621 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 581.3959 | -11.6279 | -5.4139 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.7337 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.7337 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.9745 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.9745 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C23 | 7274 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.229 |
| Bottom | 2514 | 1.05 | 0.259 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 777.6844 | 15.5537 | -29.3953 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 801.5273 | -16.0305 | 62.2289 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 34.477 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 34.477 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7241 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.7241 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C24 | 7276 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.182 |
| Bottom | 2514 | 1.05 | 0.189 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 634.6464 | -12.6929 | 1.2485 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 649.2221 | -12.9844 | 12.6507 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.063 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.063 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8908 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.8908 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C25 | 7280 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.237 |
| Bottom | 2514 | 1.05 | 0.262 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 810.477 | -16.2095 | -26.6931 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 834.32 | 16.6864 | 55.0564 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.7727 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 30.7727 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0143 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.0143 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C26 | 7282 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.328 |
| Bottom | 2514 | 1.05 | 0.375 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1112.6035 | 22.2521 | -42.4673 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1136.4465 | -30.4671 | 77.9842 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.3632 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 45.3632 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.3487 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.3487 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C27 | 7284 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.261 |
| Bottom | 2514 | 1.05 | 0.269 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 894.4433 | 17.8889 | -19.9849 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 918.2862 | -18.3657 | 30.0085 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.7888 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 18.7888 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.7935 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.7935 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C28 | 7288 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.265 |
| Bottom | 2514 | 1.05 | 0.274 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 907.3553 | -18.1471 | -19.8575 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 931.1982 | 18.624 | 34.129 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.2111 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.2111 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.288 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.288 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C29 | 7292 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.248 |
| Bottom | 2514 | 1.05 | 0.259 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 848.7479 | -16.975 | 21.0765 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 872.5908 | 17.4518 | -37.0653 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.0901 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 22.0901 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.9302 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.9302 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C30 | 7294 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.251 |
| Bottom | 2514 | 1.05 | 0.265 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 858.5001 | 17.17 | 21.26 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 882.3431 | -17.6469 | -41.6191 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.8004 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 23.8004 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7263 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.7263 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C31 | 7296 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.275 |
| Bottom | 2514 | 1.05 | 0.294 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 940.9172 | -18.8183 | -22.0004 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 964.7602 | 19.2952 | 51.5524 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.6123 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.6123 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5746 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.5746 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C32 | 7298 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.267 |
| Bottom | 2514 | 1.05 | 0.286 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 914.9275 | 18.2986 | -23.0867 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 938.7705 | -18.7754 | 49.0789 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.1799 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.1799 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6028 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.6028 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C33 | 7300 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.423 |
| Bottom | 3770 | 1.26 | 0.434 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1889.2999 | 37.786 | -51.6978 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1919.1036 | -38.3821 | 90.9877 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.5871 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 53.5871 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 16.6569 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 16.6569 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C35 | 7306 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.354 |
| Bottom | 3770 | 1.26 | 0.366 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1583.1164 | -31.6623 | -46.2949 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1612.9201 | 32.2584 | 79.0974 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.1568 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 47.1568 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.5141 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 8.5141 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C34 | 7308 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.319 |
| Bottom | 3770 | 1.26 | 0.326 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1425.56 | 28.5112 | 39.9737 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1455.3637 | -29.1073 | -50.9892 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 34.509 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 34.509 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.4637 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 9.4637 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C36 | 7312 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.341 |
| Bottom | 3770 | 1.26 | 0.348 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1521.9894 | -30.4398 | 45.4831 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.7931 | 31.0359 | -63.4427 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.2489 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 41.2489 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.369 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 9.369 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C37 | 7316 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.354 |
| Bottom | 2514 | 1.05 | 0.364 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1213.1439 | 24.2629 | 28.0052 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1236.9869 | -24.7397 | -46.7984 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.4047 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 28.4047 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3478 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.3478 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C38 | 7319 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.365 |
| Bottom | 2514 | 1.05 | 0.377 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1248.8351 | -24.9767 | 29.5692 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1272.678 | 25.4536 | -53.0853 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.301 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 31.301 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.4804 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.4804 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C39 | 7322 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.173 |
| Bottom | 5182 | 0.93 | 0.176 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1396.8822 | 27.9376 | 8.6877 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1430.2624 | -28.6052 | 21.6495 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.2478 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 8.2478 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 11.9766 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 11.9766 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C40 | 7324 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.186 |
| Bottom | 5182 | 0.93 | 0.189 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1501.6009 | -30.032 | 8.4912 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1534.981 | 30.6996 | 19.7316 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.1824 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 7.1824 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.239 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 13.239 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C41 | 7326 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.171 |
| Bottom | 5182 | 0.93 | 0.174 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1379.1428 | 27.5829 | -7.676 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1412.5229 | -28.2505 | -21.3871 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.5527 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 8.5527 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 12.1798 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 12.1798 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C42 | 7328 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.176 |
| Bottom | 5182 | 0.93 | 0.178 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1416.2176 | -28.3244 | -8.8323 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1449.5977 | 28.992 | -23.9498 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 9.4261 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 9.4261 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 12.1097 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 12.1097 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C43 | 7330 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.517 |
| Bottom | 2514 | 1.05 | 0.527 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1779.3983 | 35.588 | -24.8348 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1803.2413 | -36.0648 | 53.4484 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.2856 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 29.2856 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3627 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.3627 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C44 | 7332 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.366 |
| Bottom | 2514 | 1.05 | 0.381 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1253.1475 | -25.063 | -28.6406 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1276.9905 | 25.5398 | 56.548 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 32.0393 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 32.0393 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7155 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.7155 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C1 | 7351 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.063 |
| Bottom | 3770 | 0.77 | 0.066 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 244.2718 | -18.3273 | -44.0454 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 301.2175 | 35.4943 | 27.9141 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 23.2454 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 23.2454 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.3008 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 17.3008 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C2 | 7352 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.067 |
| Bottom | 3770 | 0.77 | 0.067 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 404.0641 | 26.5225 | -20.6898 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 461.0098 | -10.2721 | 13.6152 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9998 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9998 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9537 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.9537 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C3 | 7353 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.066 |
| Bottom | 3770 | 0.77 | 0.061 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 239.6672 | -18.3672 | 47.8513 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 296.6128 | 30.2186 | -26.7542 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 24.0462 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 24.0462 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.637 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.637 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C4 | 7354 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.066 |
| Bottom | 3770 | 0.77 | 0.065 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 393.1813 | 21.6263 | 26.5013 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 450.127 | -11.7265 | -13.2938 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1349 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.1349 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8155 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.8155 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C5 | 7355 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.059 |
| Bottom | 3770 | 0.77 | 0.053 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 237.4477 | 9.7583 | -44.1755 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 294.3934 | -17.5725 | 23.6646 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.8944 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.8944 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8641 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8641 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C6 | 7356 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.065 |
| Bottom | 3770 | 0.77 | 0.066 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 389.0712 | -21.8105 | -24.0341 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 446.0169 | 17.3541 | 13.1724 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6964 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.6964 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5585 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.5585 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C7 | 7357 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.109 |
| Bottom | 3770 | 0.77 | 0.076 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 256.0304 | 46.3575 | 68.0162 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 312.9761 | -36.5096 | -39.8868 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 34.8116 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 34.8116 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.7622 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 26.7622 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C8 | 7358 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.085 |
| Bottom | 3770 | 0.77 | 0.074 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 390.0339 | -30.8778 | 49.6361 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 446.9796 | 28.4533 | -21.3659 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.9089 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 22.9089 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.0813 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 19.0813 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C9 | 7359 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.24 |
| Bottom | 3218 | 0.89 | 0.244 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1243.5593 | -1.0871 | 32.5813 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 1268.6619 | -33.2389 | -1.4684 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.7771 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.7771 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.3073 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.3073 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C10 | 7360 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.335 |
| Bottom | 3218 | 0.89 | 0.337 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1737.8856 | -45.5326 | 2.1905 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 1762.9882 | -29.9316 | 46.1903 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.5654 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.5654 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.9831 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.9831 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C11 | 7361 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.2 |
| Bottom | 3218 | 0.89 | 0.175 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 868.9573 | 67.212 | 22.7667 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 894.0599 | 29.2366 | -23.4244 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.3433 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.3433 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.5228 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 20.5228 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C12 | 7362 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.191 |
| Bottom | 3218 | 0.89 | 0.193 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 990.0902 | 24.136 | 25.9404 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 1015.1928 | 14.263 | 26.5981 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.0173 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.0173 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3427 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.3427 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C13 | 7591 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.512 |
| Bottom | 2060 | 0.86 | 0.286 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 247.5795 | -19.393 | 189.3825 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 270.9726 | 32.0057 | -76.9925 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 102.5169 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 102.5169 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 19.717 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 19.717 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C14 | 7593 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.045 |
| Bottom | 2060 | 0.86 | 0.062 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 115.1394 | 2.3028 | 14.4409 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 138.9823 | 2.7796 | -23.6925 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.3682 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.3682 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2382 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2382 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C15 | 7596 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.097 |
| Bottom | 2060 | 0.86 | 0.127 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 208.0854 | 13.8782 | 11.1742 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 231.4785 | -13.5218 | -35.461 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.9773 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.9773 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.5703 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.5703 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C16 | 7598 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.203 |
| Bottom | 2060 | 0.86 | 0.157 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 181.6383 | -12.9127 | 76.9082 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 205.0314 | 14.5114 | -53.0315 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 49.9996 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 49.9996 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.5296 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.5296 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C18 | 7600 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.037 |
| Bottom | 2060 | 0.86 | 0.051 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 120.4568 | 2.4091 | 3.3825 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 134.7625 | 2.6953 | 15.2056 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.4465 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.4465 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1001 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1001 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C17 | 7603 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.095 |
| Bottom | 2060 | 0.86 | 0.104 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 195.5656 | -14.0176 | 11.4235 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 218.9587 | 16.0326 | -6.9775 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.6275 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.6275 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.5294 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.5294 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C20 | 7606 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.536 |
| Bottom | 2060 | 0.86 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 250.4436 | 17.6627 | 200.9458 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 273.8366 | -31.637 | -79.4573 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 107.8775 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 107.8775 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.971 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.971 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C19 | 7608 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.088 |
| Bottom | 2060 | 0.86 | 0.097 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 199.6097 | 11.0069 | 16.2477 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 223.0028 | -13.3829 | -9.931 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 10.1007 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 10.1007 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.3933 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.3933 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C21 | 7611 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.56 |
| Bottom | 2060 | 0.86 | 0.306 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 254.3173 | -17.6242 | -209.9744 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 277.7104 | 31.6297 | 87.8385 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 114.4923 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 114.4923 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 18.9218 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 18.9218 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C22 | 7613 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.042 |
| Bottom | 2060 | 0.86 | 0.056 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 115.6738 | -2.3135 | 11.9345 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 139.5168 | 2.7903 | -18.5766 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 11.509 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 11.509 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0413 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0413 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C23 | 7616 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.249 |
| Bottom | 2060 | 0.86 | 0.174 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 184.6902 | 12.5797 | -96.7366 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 208.0833 | -13.6426 | 63.9591 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.7673 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 61.7673 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0893 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.0893 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C24 | 7618 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.067 |
| Bottom | 2060 | 0.86 | 0.08 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 143.0395 | -2.8608 | -26.613 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 166.8825 | 3.3376 | 31.8829 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.0631 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 22.0631 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0987 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0987 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C25 | 7622 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.102 |
| Bottom | 2060 | 0.86 | 0.137 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 240.7 | -13.9889 | -7.6703 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 264.0931 | 12.3704 | 43.0625 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.2332 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.2332 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.1484 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.1484 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C26 | 7624 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.561 |
| Bottom | 2060 | 0.86 | 0.294 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 268.5726 | 21.7062 | -206.6262 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 291.9657 | -30.9564 | 84.7493 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 112.0471 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 112.0471 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 20.2239 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 20.2239 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C27 | 7626 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.098 |
| Bottom | 2060 | 0.86 | 0.106 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 201.4567 | 12.8475 | -19.2649 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 224.8498 | -14.9661 | 13.6034 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 12.6338 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 12.6338 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.691 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.691 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C28 | 7630 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.105 |
| Bottom | 2060 | 0.86 | 0.105 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 203.0824 | -11.7007 | -27.2966 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 226.4755 | 14.0299 | 18.369 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.5299 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.5299 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.8844 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.8844 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C29 | 7634 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.093 |
| Bottom | 2060 | 0.86 | 0.136 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 175.4252 | -15.2385 | 5.5902 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 198.8183 | 16.1816 | -36.7199 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.9489 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.9489 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.0754 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.0754 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C30 | 7636 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.092 |
| Bottom | 2060 | 0.86 | 0.14 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 177.8631 | 14.322 | 9.1728 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 201.2562 | -15.5147 | -41.4072 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.4617 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.4617 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4789 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.4789 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C31 | 7638 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.116 |
| Bottom | 2060 | 0.86 | 0.183 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 188.7052 | -17.5684 | -17.4486 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 212.0983 | 18.2468 | 57.3015 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.6938 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 28.6938 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.7552 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.7552 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C32 | 7640 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.097 |
| Bottom | 2060 | 0.86 | 0.158 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 183.3473 | 14.2173 | -14.2885 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 206.7404 | -15.3267 | 51.7036 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.353 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.353 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.3752 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.3752 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C33 | 7642 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.322 |
| Bottom | 3142 | 1.05 | 0.344 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1380.9109 | -27.6182 | 23.0754 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 1398.4558 | -30.8257 | 87.8803 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.2937 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 41.2937 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 19.3057 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 19.3057 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C35 | 7648 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.275 |
| Bottom | 3142 | 1.05 | 0.275 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1064.1361 | -21.2827 | -101.7187 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1093.3774 | 21.8675 | 89.4556 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 73.3774 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 73.3774 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.2383 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 11.2383 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C34 | 7650 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.21 |
| Bottom | 3142 | 1.05 | 0.219 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 874.8791 | 17.4976 | 50.3552 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 904.1205 | -19.3555 | -47.7097 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.8773 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 37.8773 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 12.8622 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 12.8622 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C36 | 7654 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.246 |
| Bottom | 3142 | 1.05 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1030.8995 | -20.618 | 54.3072 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1060.1409 | 21.2028 | -61.2891 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.5961 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 44.5961 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 12.1534 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 12.1534 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C37 | 7658 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.223 |
| Bottom | 2060 | 0.86 | 0.155 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 202.931 | 11.3807 | 90.3428 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 226.3241 | -13.8944 | -54.0746 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.5798 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 55.5798 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7239 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.7239 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C38 | 7661 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.236 |
| Bottom | 2060 | 0.86 | 0.165 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 210.7024 | -11.3056 | 96.9295 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 234.0954 | 13.9824 | -59.9967 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 60.3742 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 60.3742 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7146 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.7146 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C39 | 7664 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.057 |
| Bottom | 4553 | 0.81 | 0.067 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 447.7219 | -8.9544 | -8.7355 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 480.4722 | -17.2376 | 24.9205 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 17.2241 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 17.2241 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 9.904 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 9.904 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C40 | 7666 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.07 |
| Bottom | 4553 | 0.81 | 0.085 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 486.0545 | -20.3304 | -25.21 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 540.6384 | 30.44 | 28.0411 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 15.4839 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 15.4839 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 19.4147 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 19.4147 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C41 | 7668 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.057 |
| Bottom | 4553 | 0.81 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 444.478 | -8.8896 | 11.8666 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 477.2283 | -19.2724 | -24.7522 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 16.3763 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 16.3763 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 11.4189 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 11.4189 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C42 | 7670 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.062 |
| Bottom | 4553 | 0.81 | 0.075 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 441.2592 | -15.0089 | 36.242 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 495.8431 | 24.3083 | -25.7177 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 19.2354 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 19.2354 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 15.0651 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 15.0651 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C43 | 7672 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.265 |
| Bottom | 2060 | 0.86 | 0.271 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 865.4838 | -17.3097 | 29.3112 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 879.5197 | -17.5904 | 33.5405 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.5562 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.5562 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6193 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.6193 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C44 | 7674 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.243 |
| Bottom | 2060 | 0.86 | 0.182 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 223.6251 | -12.1067 | -99.4103 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 247.0182 | 14.5971 | 67.7188 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 64.2438 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 64.2438 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.2472 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.2472 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C2 | 7689 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.023 |
| Bottom | 3770 | 0.77 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | -0.0992 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | -0.1483 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C4 | 7690 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.023 |
| Bottom | 3770 | 0.77 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | -0.0282 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | -0.0421 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C6 | 7691 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.023 |
| Bottom | 3770 | 0.77 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | -0.0484 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | -0.0723 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C8 | 7692 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.023 |
| Bottom | 3770 | 0.77 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | 0.0515 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | 0.077 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C9 | 7693 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.212 |
| Bottom | 3218 | 0.89 | 0.215 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1097.6814 | 28.9788 | 0.6765 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 1123.5937 | -19.5548 | 29.6629 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.7565 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.7565 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 17.0113 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 17.0113 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C10 | 7694 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.467 |
| Bottom | 3218 | 0.89 | 0.334 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1618.8018 | 217.192 | -42.7364 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1661.989 | -68.9576 | 43.8765 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.5722 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.5722 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 89.5757 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 89.5757 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C11 | 7695 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.281 |
| Bottom | 3218 | 0.89 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 696.6186 | 104.6927 | -92.8351 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 722.5309 | 172.6097 | -96.2883 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.674 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.674 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 33.7823 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 33.7823 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C12 | 7696 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.32 |
| Bottom | 3218 | 0.89 | 0.382 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 839.5296 | 110.0682 | 111.8802 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 865.4419 | 156.2252 | 115.3334 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5377 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.5377 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.5009 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.5009 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C13 | 7824 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.619 |
| Bottom | 2060 | 0.86 | 0.597 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 56.8085 | 1.1362 | 201.7418 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 71.3842 | 4.3277 | 197.8191 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.5272 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.5272 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.0377 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.0377 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C14 | 7826 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.057 |
| Bottom | 2060 | 0.86 | 0.049 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | 0.3097 | 20.4856 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0586 | 0.6012 | 20.4835 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C15 | 7829 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.322 |
| Bottom | 2060 | 0.86 | 0.063 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 65.9446 | -1.3189 | 112.6939 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 80.5203 | -1.6104 | 28.4785 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.005 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 52.005 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4101 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.4101 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C16 | 7831 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.321 |
| Bottom | 2060 | 0.86 | 0.239 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 35.2072 | 0.8063 | 106.3317 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 49.7829 | 3.4938 | 81.9133 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.1011 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.1011 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6592 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.6592 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C18 | 7833 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.057 |
| Bottom | 2060 | 0.86 | 0.049 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | 0.3097 | -20.4873 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0586 | 0.6012 | -20.4932 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C17 | 7836 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.011 |
| Bottom | 2060 | 0.86 | 0.027 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 12.3842 | -0.2477 | 5.0455 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 36.677 | -0.7927 | -12.3034 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.4328 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.4328 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2454 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2454 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C20 | 7839 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.671 |
| Bottom | 2060 | 0.86 | 0.639 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 59.3236 | -1.2058 | 218.1392 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 73.8993 | -5.1217 | 210.7873 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.6453 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.6453 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4229 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.4229 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C19 | 7841 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.016 |
| Bottom | 2060 | 0.86 | 0.025 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 13.3402 | 0.2668 | 6.8287 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 37.633 | 0.7527 | -11.4913 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.7897 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.7897 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1683 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1683 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C21 | 7844 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.687 |
| Bottom | 2060 | 0.86 | 0.653 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 60.4596 | 1.3005 | -223.2357 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 75.0353 | 5.533 | -215.3349 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.9682 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.9682 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6095 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.6095 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C22 | 7846 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.057 |
| Bottom | 2060 | 0.86 | 0.049 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4979 | 0.31 | 20.4926 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0736 | 0.6015 | 20.4951 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C23 | 7849 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.386 |
| Bottom | 2060 | 0.86 | 0.287 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 38.6432 | -0.7729 | -126.8466 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 53.2189 | -2.7287 | -98.4295 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.5632 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.5632 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3024 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.3024 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C24 | 7851 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.057 |
| Bottom | 2060 | 0.86 | 0.049 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | 0.3097 | -20.4867 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0586 | 0.6012 | -20.4893 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C25 | 7855 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.503 |
| Bottom | 2060 | 0.86 | 0.102 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 88.6363 | 1.7727 | -173.8123 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 112.9291 | 2.2586 | 46.3955 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 81.5472 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 81.5472 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6485 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.6485 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C26 | 7857 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.673 |
| Bottom | 2060 | 0.86 | 0.644 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 59.4444 | -1.4279 | -218.7463 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 74.0201 | -6.0691 | -211.5759 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.5222 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.5222 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8655 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.8655 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C27 | 7859 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.021 |
| Bottom | 2060 | 0.86 | 0.021 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 14.2386 | 0.2848 | -8.7522 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 38.5314 | 0.7706 | 9.0938 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.6098 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.6098 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2201 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2201 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C28 | 7863 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.028 |
| Bottom | 2060 | 0.86 | 0.017 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.6631 | -0.3133 | -11.7314 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 39.9559 | -0.7991 | 6.0535 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.5847 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.5847 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1952 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1952 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C29 | 7867 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.032 |
| Bottom | 2060 | 0.86 | 0.058 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 18.3281 | 0.3666 | -13.2701 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 32.9038 | 0.6581 | -23.9331 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.5847 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.5847 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1952 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1952 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C30 | 7869 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.023 |
| Bottom | 2060 | 0.86 | 0.048 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.7526 | -0.3951 | -9.9111 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 34.3283 | -0.6889 | -20.6185 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.6098 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.6098 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2201 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2201 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C31 | 7871 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.014 |
| Bottom | 2060 | 0.86 | 0.038 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 20.1075 | 0.4021 | 6.3497 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 34.6832 | 0.7736 | 16.7839 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.4328 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.4328 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2454 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2454 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C32 | 7873 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.018 |
| Bottom | 2060 | 0.86 | 0.044 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 20.6341 | -0.4127 | 8.0867 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 35.2098 | -0.7042 | 19.0936 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.7897 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.7897 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1683 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1683 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C33 | 7875 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.371 |
| Bottom | 3142 | 1.05 | 0.352 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1261.6146 | 39.9767 | -149.5046 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 1289.7313 | -38.6449 | 119.2849 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 107.178 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 107.178 | 1000 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 31.5056 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 31.5056 | 1000 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C35 | 7881 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.86 |
| Bottom | 3142 | 1.05 | 0.806 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 955.525 | -188.5958 | 115.0717 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 973.7446 | 192.1919 | 46.768 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.2357 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 42.2357 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.0952 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.0952 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C34 | 7883 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.65 |
| Bottom | 3142 | 1.05 | 0.64 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 759.4891 | 149.9034 | 57.9121 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 789.8551 | -155.8969 | -24.1137 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.5725 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 30.5725 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.7357 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 7.7357 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C36 | 7887 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.235 |
| Bottom | 3142 | 1.05 | 0.228 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 929.5118 | -18.5902 | -78.4643 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 947.7314 | 18.9546 | -56.6262 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.3996 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 13.3996 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 13.2086 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 13.2086 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C37 | 7891 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.384 |
| Bottom | 2060 | 0.86 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 77.1227 | 1.5425 | 134.121 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 91.6984 | -1.834 | 110.5291 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.637 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.637 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0596 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0596 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C38 | 7893 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.373 |
| Bottom | 2060 | 0.86 | 0.306 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 75.9921 | 1.5198 | 130.4408 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 90.5678 | 1.8114 | 111.9918 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 11.4569 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 11.4569 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2736 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2736 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C39 | 7895 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.023 |
| Bottom | 4553 | 0.81 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.046 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0688 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C40 | 7896 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.023 |
| Bottom | 4553 | 0.81 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.0514 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0769 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C41 | 7897 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.023 |
| Bottom | 4553 | 0.81 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.0349 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0522 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C42 | 7898 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.023 |
| Bottom | 4553 | 0.81 | 0.028 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.0375 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.056 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C43 | 7899 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.379 |
| Bottom | 2060 | 0.86 | 0.271 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 760.1036 | 15.2021 | -154.1304 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 782.5969 | -15.6519 | 69.1935 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 89.0646 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 89.0646 | 1000 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.4489 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.4489 | 1000 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C44 | 7900 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.332 |
| Bottom | 2060 | 0.86 | 0.257 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 73.3038 | 1.4661 | -117.2006 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 87.8795 | 1.7576 | -95.9289 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.1728 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 13.1728 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3382 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3382 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C2 | 7922 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.015 |
| Bottom | 3770 | 0.77 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | -0.0414 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | -0.0719 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C4 | 7923 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.015 |
| Bottom | 3770 | 0.77 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | -0.0117 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | -0.0204 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C6 | 7924 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.015 |
| Bottom | 3770 | 0.77 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | -0.0202 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | -0.035 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C8 | 7925 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.015 |
| Bottom | 3770 | 0.77 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | 0.0215 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | 0.0373 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C9 | 7926 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.189 |
| Bottom | 3218 | 0.89 | 0.33 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 654.7559 | -67.3975 | 51.9169 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 678.6438 | -168.9596 | 53.811 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3768 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.3768 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 56.679 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 56.679 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C10 | 7927 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.267 |
| Bottom | 3218 | 0.89 | 0.438 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 758.1525 | -112.7624 | 65.3676 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 782.0405 | -196.4195 | 107.1746 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.7748 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.7748 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 46.9033 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 46.9033 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C11 | 7928 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.359 |
| Bottom | 3218 | 0.89 | 0.274 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 639.5304 | -163.1537 | 85.2272 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 663.4184 | -104.9997 | -88.4107 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.674 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.674 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 33.7823 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 33.7823 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C12 | 7929 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.339 |
| Bottom | 3218 | 0.89 | 0.299 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 782.4414 | -136.3159 | -104.2723 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 806.3294 | -98.1162 | -107.4558 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5377 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.5377 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.5009 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.5009 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C33 | 7982 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.516 |
| Bottom | 3142 | 1.05 | 0.516 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 773.766 | -87.1674 | 210.6293 | 1470 | 201] 1.5 [DL + LL] |
| Bottom | 784.7877 | -88.6083 | 206.0865 | 490 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.8139 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.8139 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.8998 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.8998 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C35 | 7987 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.824 |
| Bottom | 3142 | 1.05 | 0.797 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 735.01 | 150.0974 | 227.926 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 762.5644 | -150.5104 | -206.1429 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 177.2538 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 177.2538 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 13.1207 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 13.1207 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C34 | 7989 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.701 |
| Bottom | 3142 | 1.05 | 0.573 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 644.1136 | -133.9848 | -164.7943 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 671.668 | 132.5698 | 48.9739 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 87.0307 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 87.0307 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 13.9564 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 13.9564 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C36 | 7992 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.208 |
| Bottom | 3142 | 1.05 | 0.195 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 628.5944 | 22.1941 | -100.1748 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 656.1488 | 13.123 | 100.8704 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 82.0346 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 82.0346 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.4092 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.4092 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C37 | 7996 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.015 |
| Bottom | 2060 | 0.86 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | 0.9987 | 0.1788 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | 1.3172 | 0.3109 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C38 | 7997 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.015 |
| Bottom | 2060 | 0.86 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | -0.9987 | 0.1699 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | -1.3172 | 0.2954 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C39 | 7998 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.015 |
| Bottom | 4553 | 0.81 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0191 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0333 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C40 | 7999 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.015 |
| Bottom | 4553 | 0.81 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0214 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0372 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C41 | 8000 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.015 |
| Bottom | 4553 | 0.81 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0145 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0253 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C42 | 8001 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.015 |
| Bottom | 4553 | 0.81 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0156 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0271 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C43 | 8002 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.015 |
| Bottom | 2060 | 0.86 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | 0.9987 | -0.0294 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | 1.3172 | -0.0511 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C44 | 8003 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.015 |
| Bottom | 2060 | 0.86 | 0.02 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | -0.9987 | -0.122 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | -1.3172 | -0.2121 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C2 | 8029 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.005 |
| Bottom | 3770 | 0.77 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | -0.0041 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | -0.0256 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C4 | 8030 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.005 |
| Bottom | 3770 | 0.77 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | -0.0012 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | -0.0073 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C6 | 8031 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.005 |
| Bottom | 3770 | 0.77 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | -0.002 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | -0.0125 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C8 | 8032 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.005 |
| Bottom | 3770 | 0.77 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | 0.0021 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | 0.0133 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C9 | 8033 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.608 |
| Bottom | 3218 | 0.89 | 0.304 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 579.853 | 301.7332 | -45.9777 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 615.2396 | 155.7366 | -48.7836 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3768 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.3768 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 56.679 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 56.679 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C10 | 8034 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.496 |
| Bottom | 3218 | 0.89 | 0.24 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 683.2496 | 211.4688 | -126.7665 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 718.6362 | 90.6694 | -68.2505 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.7748 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.7748 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 46.9033 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 46.9033 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C11 | 8035 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.642 |
| Bottom | 3218 | 0.89 | 0.456 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 580.5529 | -303.7319 | 77.3676 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 615.9394 | -220.0228 | 82.0834 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.674 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.674 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 33.7823 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 33.7823 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C12 | 8036 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.527 |
| Bottom | 3218 | 0.89 | 0.408 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 723.4639 | -228.2942 | -130.4219 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 758.8504 | -173.6142 | -111.6776 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5377 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.5377 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.5009 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 22.5009 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C33 | 8084 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.784 |
| Bottom | 3142 | 1.05 | 0.383 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 468.3975 | 132.7938 | -195.2506 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 494.5123 | 61.7759 | -160.9958 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.6455 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.6455 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 31.6408 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 31.6408 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C35 | 8089 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 1.05 |
| Bottom | 3142 | 1.05 | 0.611 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 450.2961 | -181.0969 | -174.5767 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 493.8207 | 116.149 | -122.6385 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.3589 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 13.3589 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 35.7854 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 35.7854 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C34 | 8091 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 1.048 |
| Bottom | 3142 | 1.05 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 489.4368 | 190.5268 | 124.6713 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 532.9615 | -122.3318 | 89.5657 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.2204 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 9.2204 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 36.5588 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 36.5588 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C36 | 8094 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.729 |
| Bottom | 3142 | 1.05 | 0.264 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 413.7913 | -122.9321 | 177.5776 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 457.3159 | 60.7728 | 40.3923 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 35.4824 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 35.4824 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 41.7371 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 41.7371 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C37 | 8098 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.006 |
| Bottom | 2060 | 0.86 | 0.015 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | 0.8151 | 0.0177 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | 2.0378 | 0.1109 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C38 | 8099 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.006 |
| Bottom | 2060 | 0.86 | 0.015 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | -0.8151 | 0.0169 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | -2.0378 | 0.1053 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C39 | 8100 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.005 |
| Bottom | 4553 | 0.81 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0019 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0119 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C40 | 8101 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.005 |
| Bottom | 4553 | 0.81 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0021 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0133 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C41 | 8102 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.005 |
| Bottom | 4553 | 0.81 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0014 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.009 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C42 | 8103 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.005 |
| Bottom | 4553 | 0.81 | 0.012 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0015 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0097 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C43 | 8104 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.006 |
| Bottom | 2060 | 0.86 | 0.015 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | 0.8151 | -0.0029 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | 2.0378 | -0.0182 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C44 | 8105 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.006 |
| Bottom | 2060 | 0.86 | 0.015 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | -0.8151 | -0.0121 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | -2.0378 | -0.0756 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Shear Wall Design

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.419 | 201] 1.5 [DL + LL] | 1597.7412 | -35.876 | -208.7067 |
| Bottom | 0.371 | 201] 1.5 [DL + LL] | 1640.2537 | 32.0058 | 5.4146 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1597.7412 | -208.7067 | 67.7929 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1640.2537 | 5.4146 | 67.7929 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.412 | 201] 1.5 [DL + LL] | 1816.0696 | -29.2993 | 81.1281 |
| Bottom | 0.42 | 201] 1.5 [DL + LL] | 1858.5821 | 30.7647 | -34.778 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1816.0696 | 81.1281 | -37.0243 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1858.5821 | -34.778 | -37.0243 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.457 | 201] 1.5 [DL + LL] | 2036.3207 | -30.7155 | 45.8652 |
| Bottom | 0.465 | 201] 1.5 [DL + LL] | 2078.8332 | 31.0699 | -39.3898 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2036.3207 | 45.8652 | -27.2565 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2078.8332 | -39.3898 | -27.2565 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.502 | 201] 1.5 [DL + LL] | 2257.8718 | -31.7454 | 42.5158 |
| Bottom | 0.51 | 201] 1.5 [DL + LL] | 2300.3843 | 31.8396 | -39.569 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2257.8718 | 42.5158 | -26.2571 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2300.3843 | -39.569 | -26.2571 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.547 | 201] 1.5 [DL + LL] | 2480.4835 | -32.5348 | 42.8826 |
| Bottom | 0.555 | 201] 1.5 [DL + LL] | 2522.996 | 32.5651 | -39.8104 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2480.4835 | 42.8826 | -26.4582 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2522.996 | -39.8104 | -26.4582 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.593 | 201] 1.5 [DL + LL] | 2703.8775 | -33.1721 | 42.8852 |
| Bottom | 0.6 | 201] 1.5 [DL + LL] | 2746.39 | 33.1679 | -39.8909 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2703.8775 | 42.8852 | -26.4911 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2746.39 | -39.8909 | -26.4911 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.609 | 201] 1.5 [DL + LL] | 2927.7748 | -33.7054 | 42.7575 |
| Bottom | 0.618 | 201] 1.5 [DL + LL] | 2970.2872 | 33.661 | -39.8598 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2927.7748 | 42.7575 | -26.446 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2970.2872 | -39.8598 | -26.446 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.654 | 201] 1.5 [DL + LL] | 3151.9001 | -34.1312 | 42.4481 |
| Bottom | 0.663 | 201] 1.5 [DL + LL] | 3194.4126 | 34.0204 | -39.8605 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3151.9001 | 42.4481 | -26.3525 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3194.4126 | -39.8605 | -26.3525 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.716 | 201] 1.5 [DL + LL] | 3375.9738 | -34.4974 | 41.7873 |
| Bottom | 0.725 | 201] 1.5 [DL + LL] | 3418.4863 | 34.4654 | -38.8558 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3375.9738 | 41.7873 | -25.8281 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3418.4863 | -38.8558 | -25.8281 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.762 | 201] 1.5 [DL + LL] | 3599.6788 | -34.4082 | 41.8783 |
| Bottom | 0.771 | 201] 1.5 [DL + LL] | 3642.1913 | 33.7276 | -35.8519 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3599.6788 | 41.8783 | -24.8981 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3642.1913 | -35.8519 | -24.8981 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.791 | 201] 1.5 [DL + LL] | 3822.9843 | -35.9728 | 43.8676 |
| Bottom | 0.796 | 201] 1.5 [DL + LL] | 3865.4968 | 36.2928 | -80.6236 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3822.9843 | 43.8676 | -39.7921 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3865.4968 | -80.6236 | -39.7921 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.838 | 201] 1.5 [DL + LL] | 4046.1272 | -33.9325 | -4.5791 |
| Bottom | 0.848 | 201] 1.5 [DL + LL] | 4088.6397 | 32.4511 | 222.041 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4046.1272 | -4.5791 | 71.795 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4088.6397 | 222.041 | 71.795 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.729 | 201] 1.5 [DL + LL] | 4269.1305 | -70.2038 | -907.1521 |
| Bottom | 0.637 | 201] 1.5 [DL + LL] | 4332.8992 | 63.4987 | -21.7828 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4269.1305 | -907.1521 | 281.1347 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4332.8992 | -21.7828 | 281.1347 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.67 | 201] 1.5 [DL + LL] | 4531.5495 | -70.388 | 79.2996 |
| Bottom | 0.676 | 201] 1.5 [DL + LL] | 4595.3182 | 68.3532 | -19.0781 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4531.5495 | 79.2996 | -31.5383 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4595.3182 | -19.0781 | -31.5383 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.7 | 201] 1.5 [DL + LL] | 4792.0076 | -65.4219 | 79.6442 |
| Bottom | 0.71 | 201] 1.5 [DL + LL] | 4855.7763 | 65.4565 | -44.4956 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4792.0076 | 79.6442 | -39.6169 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4855.7763 | -44.4956 | -39.6169 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 201] 1.5 [DL + LL] | 5049.2503 | -64.9278 | 51.5225 |
| Bottom | 0.746 | 201] 1.5 [DL + LL] | 5113.019 | 64.189 | -41.7983 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5049.2503 | 51.5225 | -29.8125 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5113.019 | -41.7983 | -29.8125 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.773 | 201] 1.5 [DL + LL] | 5303.8499 | -63.9951 | 50.9136 |
| Bottom | 0.781 | 201] 1.5 [DL + LL] | 5367.6186 | 63.0967 | -39.9002 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5303.8499 | 50.9136 | -29.0053 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5367.6186 | -39.9002 | -29.0053 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.808 | 201] 1.5 [DL + LL] | 5555.8664 | -62.9501 | 49.5492 |
| Bottom | 0.816 | 201] 1.5 [DL + LL] | 5619.6351 | 61.8674 | -40.0488 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5555.8664 | 49.5492 | -28.6056 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5619.6351 | -40.0488 | -28.6056 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.842 | 201] 1.5 [DL + LL] | 5805.155 | -62.0403 | 45.9352 |
| Bottom | 0.851 | 201] 1.5 [DL + LL] | 5868.9237 | 61.0399 | -40.5065 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5805.155 | 45.9352 | -27.5967 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5868.9237 | -40.5065 | -27.5967 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.876 | 201] 1.5 [DL + LL] | 6051.433 | -60.3743 | 41.6379 |
| Bottom | 0.884 | 201] 1.5 [DL + LL] | 6115.2016 | 57.5959 | -36.3589 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6051.433 | 41.6379 | -24.9172 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6115.2016 | -36.3589 | -24.9172 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 201] 1.5 [DL + LL] | 6294.8594 | -63.0408 | 41.9277 |
| Bottom | 0.925 | 201] 1.5 [DL + LL] | 6360.6525 | 70.8287 | -16.5866 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6294.8594 | 41.9277 | -18.1389 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6360.6525 | -16.5866 | -18.1389 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.016 | 201] 1.5 [DL + LL] | 6560.4846 | -172.2744 | 43.0466 |
| Bottom | 1.025 | 201] 1.5 [DL + LL] | 6645.5095 | 174.7741 | 16.0481 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6560.4846 | 43.0466 | -6.4364 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6645.5095 | 16.0481 | -6.4364 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.044 | 201] 1.5 [DL + LL] | 6795.4833 | -172.8984 | 38.337 |
| Bottom | 1.06 | 201] 1.5 [DL + LL] | 6876.8643 | 175.0903 | -59.7918 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6795.4833 | 38.337 | -24.2817 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6876.8643 | -59.7918 | -24.2817 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.419 | 201] 1.5 [DL + LL] | 984.3267 | 79.3525 | 64.6571 |
| Bottom | 0.358 | 201] 1.5 [DL + LL] | 1026.8391 | -66.5044 | 31.3408 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 984.3267 | 64.6571 | -10.4774 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1026.8391 | 31.3408 | -10.4774 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.383 | 201] 1.5 [DL + LL] | 1259.4739 | 58.6761 | -75.3065 |
| Bottom | 0.382 | 201] 1.5 [DL + LL] | 1301.9864 | -60.1763 | 48.5888 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1259.4739 | -75.3065 | 39.4573 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1301.9864 | 48.5888 | 39.4573 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.431 | 201] 1.5 [DL + LL] | 1532.9045 | 61.866 | -60.0387 |
| Bottom | 0.435 | 201] 1.5 [DL + LL] | 1575.4169 | -61.1747 | 53.1925 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1532.9045 | -60.0387 | 36.0651 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1575.4169 | 53.1925 | 36.0651 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.476 | 201] 1.5 [DL + LL] | 1805.6097 | 61.1547 | -54.6421 |
| Bottom | 0.483 | 201] 1.5 [DL + LL] | 1848.1221 | -61.0249 | 52.5807 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1805.6097 | -54.6421 | 34.1702 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1848.1221 | 52.5807 | 34.1702 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.518 | 201] 1.5 [DL + LL] | 2078.0673 | 61.3426 | -53.4191 |
| Bottom | 0.524 | 201] 1.5 [DL + LL] | 2120.5797 | -61.2427 | 51.3038 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2078.0673 | -53.4191 | 33.3922 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2120.5797 | 51.3038 | 33.3922 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.568 | 201] 1.5 [DL + LL] | 2350.8193 | 61.6178 | -52.6674 |
| Bottom | 0.576 | 201] 1.5 [DL + LL] | 2393.3318 | -61.6154 | 50.0243 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2350.8193 | -52.6674 | 32.7609 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2393.3318 | 50.0243 | 32.7609 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.607 | 201] 1.5 [DL + LL] | 2624.3974 | 62.1237 | -51.7715 |
| Bottom | 0.614 | 201] 1.5 [DL + LL] | 2666.9099 | -62.2053 | 48.7973 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2624.3974 | -51.7715 | 32.0978 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2666.9099 | 48.7973 | 32.0978 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 201] 1.5 [DL + LL] | 2899.3465 | 62.8293 | -50.6514 |
| Bottom | 0.668 | 201] 1.5 [DL + LL] | 2941.8589 | -62.982 | 47.3377 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2899.3465 | -50.6514 | 31.2873 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2941.8589 | 47.3377 | 31.2873 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.695 | 201] 1.5 [DL + LL] | 3176.2323 | 63.8026 | -49.576 |
| Bottom | 0.703 | 201] 1.5 [DL + LL] | 3218.7447 | -64.1168 | 45.5084 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3176.2323 | -49.576 | 30.3698 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3218.7447 | 45.5084 | 30.3698 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.748 | 201] 1.5 [DL + LL] | 3455.6079 | 64.7672 | -48.807 |
| Bottom | 0.755 | 201] 1.5 [DL + LL] | 3498.1203 | -64.754 | 46.2848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3455.6079 | -48.807 | 30.3742 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3498.1203 | 46.2848 | 30.3742 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.803 | 201] 1.5 [DL + LL] | 3738.3077 | 67.2894 | -44.7134 |
| Bottom | 0.821 | 201] 1.5 [DL + LL] | 3780.8201 | -68.8618 | 83.3468 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3738.3077 | -44.7134 | 40.9257 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3780.8201 | 83.3468 | 40.9257 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.854 | 201] 1.5 [DL + LL] | 4024.325 | 64.9213 | 0.1664 |
| Bottom | 0.874 | 201] 1.5 [DL + LL] | 4066.8374 | -59.6239 | -238.2993 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4024.325 | 0.1664 | -75.5919 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4066.8374 | -238.2993 | -75.5919 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 201] 1.5 [DL + LL] | 4292.1961 | 69.0524 | 900.6647 |
| Bottom | 0.638 | 201] 1.5 [DL + LL] | 4355.9648 | -62.4426 | 67.0333 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4292.1961 | 900.6647 | -264.9296 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4355.9648 | 67.0333 | -264.9296 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.67 | 201] 1.5 [DL + LL] | 4571.5547 | 62.0498 | 17.0226 |
| Bottom | 0.679 | 201] 1.5 [DL + LL] | 4635.3234 | -62.0177 | -13.181 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4571.5547 | 17.0226 | -9.3132 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4635.3234 | -13.181 | -9.3132 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.708 | 201] 1.5 [DL + LL] | 4855.0162 | 61.484 | -57.8662 |
| Bottom | 0.719 | 201] 1.5 [DL + LL] | 4918.7849 | -61.1886 | 9.0114 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4855.0162 | -57.8662 | 21.4254 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4918.7849 | 9.0114 | 21.4254 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.749 | 201] 1.5 [DL + LL] | 5141.2758 | 61.1263 | -34.7786 |
| Bottom | 0.758 | 201] 1.5 [DL + LL] | 5205.0445 | -60.7812 | 15.6696 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5141.2758 | -34.7786 | 16.1553 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5205.0445 | 15.6696 | 16.1553 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.79 | 201] 1.5 [DL + LL] | 5430.7906 | 60.9093 | -24.8951 |
| Bottom | 0.799 | 201] 1.5 [DL + LL] | 5494.5593 | -60.5678 | 15.2677 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5430.7906 | -24.8951 | 12.8736 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5494.5593 | 15.2677 | 12.8736 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.831 | 201] 1.5 [DL + LL] | 5723.9038 | 60.7476 | -21.4291 |
| Bottom | 0.84 | 201] 1.5 [DL + LL] | 5787.6725 | -60.4557 | 15.1389 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5723.9038 | -21.4291 | 11.7261 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5787.6725 | 15.1389 | 11.7261 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.873 | 201] 1.5 [DL + LL] | 6021.1503 | 60.7722 | -17.1217 |
| Bottom | 0.882 | 201] 1.5 [DL + LL] | 6084.9189 | -60.6679 | 18.2297 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6021.1503 | -17.1217 | 11.3459 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6084.9189 | 18.2297 | 11.3459 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.915 | 201] 1.5 [DL + LL] | 6322.2004 | 60.3592 | -9.7958 |
| Bottom | 0.925 | 201] 1.5 [DL + LL] | 6385.969 | -60.0557 | -3.2596 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6322.2004 | -9.7958 | 2.2144 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6385.969 | -3.2596 | 2.2144 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.96 | 201] 1.5 [DL + LL] | 6632.1356 | 62.6076 | -22.3088 |
| Bottom | 0.97 | 201] 1.5 [DL + LL] | 6697.9287 | -66.432 | 32.0945 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6632.1356 | -22.3088 | 16.8571 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6697.9287 | 32.0945 | 16.8571 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.125 | 201] 1.5 [DL + LL] | 6927.057 | 225.0867 | -50.8389 |
| Bottom | 1.139 | 201] 1.5 [DL + LL] | 7012.0819 | -227.5864 | 49.7679 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6927.057 | -50.8389 | 24.0522 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7012.0819 | 49.7679 | 24.0522 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.135 | 201] 1.5 [DL + LL] | 7184.3292 | 207.047 | -55.0901 |
| Bottom | 1.142 | 201] 1.5 [DL + LL] | 7265.7101 | -209.2389 | 9.2536 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7184.3292 | -55.0901 | 16.0476 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7265.7101 | 9.2536 | 16.0476 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.363 | 201] 1.5 [DL + LL] | 1142.9023 | 50.0115 | -146.631 |
| Bottom | 0.311 | 201] 1.5 [DL + LL] | 1185.4147 | -45.0809 | -5.6435 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1142.9023 | -146.631 | 44.6844 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1185.4147 | -5.6435 | 44.6844 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.343 | 201] 1.5 [DL + LL] | 1331.0458 | 44.071 | 35.2728 |
| Bottom | 0.345 | 201] 1.5 [DL + LL] | 1373.5583 | -44.2358 | -17.207 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1331.0458 | 35.2728 | -16.7966 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1373.5583 | -17.207 | -16.7966 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.378 | 201] 1.5 [DL + LL] | 1521.5604 | 46.0174 | 26.0013 |
| Bottom | 0.384 | 201] 1.5 [DL + LL] | 1564.0729 | -45.3859 | -20.0817 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1521.5604 | 26.0013 | -14.7598 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1564.0729 | -20.0817 | -14.7598 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.414 | 201] 1.5 [DL + LL] | 1713.5437 | 45.5188 | 24.7714 |
| Bottom | 0.421 | 201] 1.5 [DL + LL] | 1756.0561 | -45.2115 | -21.3591 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1713.5437 | 24.7714 | -14.7791 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1756.0561 | -21.3591 | -14.7791 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.451 | 201] 1.5 [DL + LL] | 1906.3983 | 45.2747 | 25.2877 |
| Bottom | 0.458 | 201] 1.5 [DL + LL] | 1948.9108 | -44.8475 | -22.4897 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1906.3983 | 25.2877 | -15.3074 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1948.9108 | -22.4897 | -15.3074 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.488 | 201] 1.5 [DL + LL] | 2099.8816 | 44.7898 | 26.1333 |
| Bottom | 0.494 | 201] 1.5 [DL + LL] | 2142.3941 | -44.2581 | -23.7079 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2099.8816 | 26.1333 | -15.9675 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2142.3941 | -23.7079 | -15.9675 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.524 | 201] 1.5 [DL + LL] | 2293.7777 | 44.1006 | 27.1125 |
| Bottom | 0.531 | 201] 1.5 [DL + LL] | 2336.2902 | -43.4614 | -25.0012 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2293.7777 | 27.1125 | -16.6934 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2336.2902 | -25.0012 | -16.6934 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.561 | 201] 1.5 [DL + LL] | 2487.8763 | 43.1845 | 28.2607 |
| Bottom | 0.568 | 201] 1.5 [DL + LL] | 2530.3887 | -42.4511 | -26.3935 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2487.8763 | 28.2607 | -17.5039 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2530.3887 | -26.3935 | -17.5039 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.597 | 201] 1.5 [DL + LL] | 2681.9666 | 42.0222 | 29.5784 |
| Bottom | 0.604 | 201] 1.5 [DL + LL] | 2724.479 | -41.1116 | -27.2201 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2681.9666 | 29.5784 | -18.1872 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2724.479 | -27.2201 | -18.1872 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.634 | 201] 1.5 [DL + LL] | 2875.911 | 40.8318 | 31.8012 |
| Bottom | 0.642 | 201] 1.5 [DL + LL] | 2918.4235 | -40.2748 | -28.7905 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2875.911 | 31.8012 | -19.3889 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2918.4235 | -28.7905 | -19.3889 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.641 | 201] 1.5 [DL + LL] | 3069.2386 | 38.0157 | 33.7321 |
| Bottom | 0.648 | 201] 1.5 [DL + LL] | 3111.751 | -36.2217 | -70.0939 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3069.2386 | 33.7321 | -33.163 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3111.751 | -70.0939 | -33.163 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.682 | 201] 1.5 [DL + LL] | 3260.5868 | 38.7023 | -6.7072 |
| Bottom | 0.697 | 201] 1.5 [DL + LL] | 3303.0993 | -38.977 | 190.3227 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3260.5868 | -6.7072 | 62.4096 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3303.0993 | 190.3227 | 62.4096 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.652 | 201] 1.5 [DL + LL] | 3491.8175 | 94.906 | -705.583 |
| Bottom | 0.556 | 201] 1.5 [DL + LL] | 3555.5862 | -84.1598 | -42.3069 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3491.8175 | -705.583 | 210.609 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3555.5862 | -42.3069 | 210.609 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.56 | 201] 1.5 [DL + LL] | 3740.695 | 66.267 | 50.0703 |
| Bottom | 0.565 | 201] 1.5 [DL + LL] | 3804.4636 | -68.1488 | -12.5073 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3740.695 | 50.0703 | -20.1067 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3804.4636 | -12.5073 | -20.1067 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.598 | 201] 1.5 [DL + LL] | 3982.0597 | 69.7408 | 75.5061 |
| Bottom | 0.598 | 201] 1.5 [DL + LL] | 4045.8283 | -67.1291 | -35.9778 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3982.0597 | 75.5061 | -35.5561 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4045.8283 | -35.9778 | -35.5561 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.621 | 201] 1.5 [DL + LL] | 4218.6103 | 65.7345 | 47.6761 |
| Bottom | 0.629 | 201] 1.5 [DL + LL] | 4282.379 | -63.7794 | -36.2502 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4218.6103 | 47.6761 | -26.7831 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4282.379 | -36.2502 | -26.7831 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.652 | 201] 1.5 [DL + LL] | 4449.162 | 62.0715 | 42.3015 |
| Bottom | 0.66 | 201] 1.5 [DL + LL] | 4512.9307 | -60.0619 | -31.9781 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4449.162 | 42.3015 | -23.7132 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4512.9307 | -31.9781 | -23.7132 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.682 | 201] 1.5 [DL + LL] | 4673.4518 | 58.244 | 41.6311 |
| Bottom | 0.69 | 201] 1.5 [DL + LL] | 4737.2204 | -56.4788 | -29.611 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4673.4518 | 41.6311 | -22.7358 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4737.2204 | -29.611 | -22.7358 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 201] 1.5 [DL + LL] | 4891.0546 | 53.2321 | 39.2482 |
| Bottom | 0.718 | 201] 1.5 [DL + LL] | 4954.8232 | -49.9501 | -34.6387 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4891.0546 | 39.2482 | -23.5637 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4954.8232 | -34.6387 | -23.5637 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.74 | 201] 1.5 [DL + LL] | 5102.4438 | 52.9894 | 29.2761 |
| Bottom | 0.751 | 201] 1.5 [DL + LL] | 5166.2125 | -58.5995 | -42.4146 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5102.4438 | 29.2761 | -22.8854 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5166.2125 | -42.4146 | -22.8854 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 201] 1.5 [DL + LL] | 5301.6374 | 21.7188 | 16.9001 |
| Bottom | 0.76 | 201] 1.5 [DL + LL] | 5367.4305 | 18.8179 | 76.718 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5301.6374 | 16.9001 | 18.295 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5367.4305 | 76.718 | 18.295 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.97 | 201] 1.5 [DL + LL] | 5827.3569 | -208.6441 | -43.0869 |
| Bottom | 0.99 | 201] 1.5 [DL + LL] | 5912.3818 | 211.1438 | 83.9689 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5827.3569 | -43.0869 | 30.2709 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5912.3818 | 83.9689 | 30.2709 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.951 | 201] 1.5 [DL + LL] | 6382.6692 | -139.2735 | 21.0852 |
| Bottom | 0.972 | 201] 1.5 [DL + LL] | 6464.0502 | 141.4654 | -75.9001 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6382.6692 | 21.0852 | -23.9476 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6464.0502 | -75.9001 | -23.9476 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.377 | 201] 1.5 [DL + LL] | 1140.1401 | -54.2593 | -151.4831 |
| Bottom | 0.322 | 201] 1.5 [DL + LL] | 1182.6526 | 49.9107 | -5.241 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1140.1401 | -151.4831 | 46.3787 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1182.6526 | -5.241 | 46.3787 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.351 | 201] 1.5 [DL + LL] | 1327.118 | -48.5437 | 28.4491 |
| Bottom | 0.354 | 201] 1.5 [DL + LL] | 1369.6305 | 48.9428 | -13.8606 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1327.118 | 28.4491 | -13.5469 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1369.6305 | -13.8606 | -13.5469 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.385 | 201] 1.5 [DL + LL] | 1516.0308 | -50.2277 | 21.8201 |
| Bottom | 0.39 | 201] 1.5 [DL + LL] | 1558.5432 | 49.8339 | -16.5696 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1516.0308 | 21.8201 | -12.2971 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1558.5432 | -16.5696 | -12.2971 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.419 | 201] 1.5 [DL + LL] | 1706.0587 | -49.5952 | 20.6854 |
| Bottom | 0.426 | 201] 1.5 [DL + LL] | 1748.5712 | 49.483 | -17.7775 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1706.0587 | 20.6854 | -12.3236 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1748.5712 | -17.7775 | -12.3236 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.455 | 201] 1.5 [DL + LL] | 1896.6537 | -49.2027 | 21.2152 |
| Bottom | 0.462 | 201] 1.5 [DL + LL] | 1939.1661 | 48.9612 | -18.8235 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1896.6537 | 21.2152 | -12.8282 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1939.1661 | -18.8235 | -12.8282 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.491 | 201] 1.5 [DL + LL] | 2087.5885 | -48.5612 | 22.1026 |
| Bottom | 0.498 | 201] 1.5 [DL + LL] | 2130.1009 | 48.2179 | -20.0126 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2087.5885 | 22.1026 | -13.4912 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2130.1009 | -20.0126 | -13.4912 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.526 | 201] 1.5 [DL + LL] | 2278.6448 | -47.6968 | 23.0789 |
| Bottom | 0.533 | 201] 1.5 [DL + LL] | 2321.1573 | 47.258 | -21.3249 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2278.6448 | 23.0789 | -14.2213 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2321.1573 | -21.3249 | -14.2213 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.562 | 201] 1.5 [DL + LL] | 2469.5944 | -46.5816 | 24.1783 |
| Bottom | 0.569 | 201] 1.5 [DL + LL] | 2512.1068 | 46.0689 | -22.7691 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2469.5944 | 24.1783 | -15.0322 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2512.1068 | -22.7691 | -15.0322 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.597 | 201] 1.5 [DL + LL] | 2660.1941 | -45.1856 | 25.4083 |
| Bottom | 0.603 | 201] 1.5 [DL + LL] | 2702.7065 | 44.5276 | -23.6168 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2660.1941 | 25.4083 | -15.6945 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2702.7065 | -23.6168 | -15.6945 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.632 | 201] 1.5 [DL + LL] | 2850.255 | -43.7086 | 27.5651 |
| Bottom | 0.639 | 201] 1.5 [DL + LL] | 2892.7674 | 43.4528 | -25.2823 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2850.255 | 27.5651 | -16.9063 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2892.7674 | -25.2823 | -16.9063 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.637 | 201] 1.5 [DL + LL] | 3039.2345 | -40.5349 | 29.3432 |
| Bottom | 0.645 | 201] 1.5 [DL + LL] | 3081.747 | 39.071 | -66.42 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3039.2345 | 29.3432 | -30.581 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3081.747 | -66.42 | -30.581 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.676 | 201] 1.5 [DL + LL] | 3225.7263 | -40.8728 | -10.8945 |
| Bottom | 0.694 | 201] 1.5 [DL + LL] | 3268.2387 | 41.7011 | 187.8377 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3225.7263 | -10.8945 | 62.9609 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3268.2387 | 187.8377 | 62.9609 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.654 | 201] 1.5 [DL + LL] | 3458.4174 | -98.16 | -701.5079 |
| Bottom | 0.555 | 201] 1.5 [DL + LL] | 3522.1861 | 87.5504 | -38.0316 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3458.4174 | -701.5079 | 210.669 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3522.1861 | -38.0316 | 210.669 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.559 | 201] 1.5 [DL + LL] | 3708.5523 | -69.0675 | 50.2965 |
| Bottom | 0.562 | 201] 1.5 [DL + LL] | 3772.321 | 71.1667 | -9.3064 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3708.5523 | 50.2965 | -19.1549 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3772.321 | -9.3064 | -19.1549 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.597 | 201] 1.5 [DL + LL] | 3951.0045 | -72.4003 | 75.0063 |
| Bottom | 0.596 | 201] 1.5 [DL + LL] | 4014.7732 | 69.9594 | -34.0524 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3951.0045 | 75.0063 | -34.7745 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4014.7732 | -34.0524 | -34.7745 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 201] 1.5 [DL + LL] | 4188.5093 | -68.1925 | 46.1642 |
| Bottom | 0.626 | 201] 1.5 [DL + LL] | 4252.278 | 66.4331 | -34.7615 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4188.5093 | 46.1642 | -25.8175 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4252.278 | -34.7615 | -25.8175 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.649 | 201] 1.5 [DL + LL] | 4419.8572 | -64.2887 | 40.57 |
| Bottom | 0.657 | 201] 1.5 [DL + LL] | 4483.6258 | 62.513 | -30.6329 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4419.8572 | 40.57 | -22.7234 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4483.6258 | -30.6329 | -22.7234 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.679 | 201] 1.5 [DL + LL] | 4644.7429 | -60.1691 | 39.9734 |
| Bottom | 0.687 | 201] 1.5 [DL + LL] | 4708.5115 | 58.6806 | -28.614 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4644.7429 | 39.9734 | -21.8804 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4708.5115 | -28.614 | -21.8804 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.707 | 201] 1.5 [DL + LL] | 4862.692 | -54.8212 | 37.4632 |
| Bottom | 0.715 | 201] 1.5 [DL + LL] | 4926.4607 | 51.8646 | -34.5744 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4862.692 | 37.4632 | -22.9657 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4926.4607 | -34.5744 | -22.9657 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 201] 1.5 [DL + LL] | 5074.1153 | -54.177 | 26.7524 |
| Bottom | 0.748 | 201] 1.5 [DL + LL] | 5137.884 | 60.1507 | -42.2985 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5074.1153 | 26.7524 | -22.0412 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5137.884 | -42.2985 | -22.0412 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.751 | 201] 1.5 [DL + LL] | 5272.9733 | -22.5018 | 14.572 |
| Bottom | 0.756 | 201] 1.5 [DL + LL] | 5338.7664 | -17.5957 | 80.6315 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5272.9733 | 14.572 | 20.2186 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5338.7664 | 80.6315 | 20.2186 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.875 | 201] 1.5 [DL + LL] | 5797.3536 | 133.0619 | -41.9087 |
| Bottom | 0.893 | 201] 1.5 [DL + LL] | 5882.3784 | -135.5617 | 76.4284 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5797.3536 | -41.9087 | 28.1986 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5882.3784 | 76.4284 | 28.1986 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.028 | 201] 1.5 [DL + LL] | 6358.163 | 204.1031 | 29.3873 |
| Bottom | 1.046 | 201] 1.5 [DL + LL] | 6439.5439 | -206.295 | -80.1232 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6358.163 | 29.3873 | -27.0629 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6439.5439 | -80.1232 | -27.0629 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.42 | 201] 1.5 [DL + LL] | 975.8292 | 80.9648 | -55.1333 |
| Bottom | 0.366 | 201] 1.5 [DL + LL] | 1018.3416 | -68.0815 | -42.7824 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 975.8292 | -55.1333 | 3.9868 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1018.3416 | -42.7824 | 3.9868 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.385 | 201] 1.5 [DL + LL] | 1250.3152 | 59.4049 | 78.5556 |
| Bottom | 0.388 | 201] 1.5 [DL + LL] | 1292.8276 | -61.1194 | -58.2363 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1250.3152 | 78.5556 | -43.3538 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1292.8276 | -58.2363 | -43.3538 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.432 | 201] 1.5 [DL + LL] | 1522.7973 | 62.6449 | 64.1892 |
| Bottom | 0.437 | 201] 1.5 [DL + LL] | 1565.3097 | -61.9921 | -61.9566 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1522.7973 | 64.1892 | -39.9377 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1565.3097 | -61.9566 | -39.9377 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.477 | 201] 1.5 [DL + LL] | 1794.4276 | 61.8174 | 58.9808 |
| Bottom | 0.484 | 201] 1.5 [DL + LL] | 1836.9401 | -61.7161 | -60.8376 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1794.4276 | 58.9808 | -37.9138 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1836.9401 | -60.8376 | -37.9138 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.518 | 201] 1.5 [DL + LL] | 2065.6988 | 61.927 | 57.6913 |
| Bottom | 0.526 | 201] 1.5 [DL + LL] | 2108.2113 | -61.8438 | -59.2785 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2065.6988 | 57.6913 | -36.9995 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2108.2113 | -59.2785 | -36.9995 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.567 | 201] 1.5 [DL + LL] | 2337.1773 | 62.1318 | 56.6787 |
| Bottom | 0.575 | 201] 1.5 [DL + LL] | 2379.6898 | -62.1448 | -57.8277 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2337.1773 | 56.6787 | -36.2082 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2379.6898 | -57.8277 | -36.2082 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.605 | 201] 1.5 [DL + LL] | 2609.4176 | 62.5739 | 55.3938 |
| Bottom | 0.613 | 201] 1.5 [DL + LL] | 2651.93 | -62.6752 | -56.4927 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2609.4176 | 55.3938 | -35.3685 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2651.93 | -56.4927 | -35.3685 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.658 | 201] 1.5 [DL + LL] | 2882.9856 | 63.2163 | 53.7729 |
| Bottom | 0.666 | 201] 1.5 [DL + LL] | 2925.498 | -63.3981 | -54.9925 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2882.9856 | 53.7729 | -34.3722 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2925.498 | -54.9925 | -34.3722 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.693 | 201] 1.5 [DL + LL] | 3158.4678 | 64.123 | 52.051 |
| Bottom | 0.702 | 201] 1.5 [DL + LL] | 3200.9803 | -64.4833 | -53.2609 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3158.4678 | 52.051 | -33.2731 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3200.9803 | -53.2609 | -33.2731 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.745 | 201] 1.5 [DL + LL] | 3436.4378 | 65.0046 | 50.3726 |
| Bottom | 0.754 | 201] 1.5 [DL + LL] | 3478.9503 | -65.0446 | -54.1562 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3436.4378 | 50.3726 | -33.028 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3478.9503 | -54.1562 | -33.028 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.8 | 201] 1.5 [DL + LL] | 3717.7572 | 67.4679 | 45.1738 |
| Bottom | 0.819 | 201] 1.5 [DL + LL] | 3760.2696 | -69.1814 | -91.097 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3717.7572 | 45.1738 | -43.202 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3760.2696 | -91.097 | -43.202 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.85 | 201] 1.5 [DL + LL] | 4002.4252 | 64.8266 | -0.7201 |
| Bottom | 0.87 | 201] 1.5 [DL + LL] | 4044.9376 | -59.5989 | 228.5165 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4002.4252 | -0.7201 | 72.9671 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4044.9376 | 228.5165 | 72.9671 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.726 | 201] 1.5 [DL + LL] | 4269.3209 | 68.6973 | -896.4517 |
| Bottom | 0.636 | 201] 1.5 [DL + LL] | 4333.0895 | -62.1849 | -76.96 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4269.3209 | -896.4517 | 260.7027 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4333.0895 | -76.96 | 260.7027 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.666 | 201] 1.5 [DL + LL] | 4547.9971 | 61.9709 | -19.3316 |
| Bottom | 0.676 | 201] 1.5 [DL + LL] | 4611.7658 | -61.8668 | 5.1703 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4547.9971 | -19.3316 | 7.7663 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4611.7658 | 5.1703 | 7.7663 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.705 | 201] 1.5 [DL + LL] | 4830.9301 | 61.507 | 56.7995 |
| Bottom | 0.715 | 201] 1.5 [DL + LL] | 4894.6988 | -61.1685 | -16.3737 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4830.9301 | 56.7995 | -23.165 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4894.6988 | -16.3737 | -23.165 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.746 | 201] 1.5 [DL + LL] | 5116.7613 | 61.1762 | 33.8278 |
| Bottom | 0.755 | 201] 1.5 [DL + LL] | 5180.53 | -60.8348 | -23.6663 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5116.7613 | 33.8278 | -18.1383 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5180.53 | -23.6663 | -18.1383 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.787 | 201] 1.5 [DL + LL] | 5405.9378 | 61.0053 | 22.7499 |
| Bottom | 0.795 | 201] 1.5 [DL + LL] | 5469.7065 | -60.6883 | -24.1053 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5405.9378 | 22.7499 | -14.7552 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5469.7065 | -24.1053 | -14.7552 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.828 | 201] 1.5 [DL + LL] | 5698.7998 | 60.8809 | 17.7499 |
| Bottom | 0.836 | 201] 1.5 [DL + LL] | 5762.5685 | -60.6345 | -24.7659 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5698.7998 | 17.7499 | -13.3906 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5762.5685 | -24.7659 | -13.3906 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.87 | 201] 1.5 [DL + LL] | 5995.8834 | 60.9366 | 11.8099 |
| Bottom | 0.878 | 201] 1.5 [DL + LL] | 6059.6521 | -60.9091 | -28.6796 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5995.8834 | 11.8099 | -12.7823 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6059.6521 | -28.6796 | -12.7823 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 201] 1.5 [DL + LL] | 6296.8594 | 60.529 | 2.6596 |
| Bottom | 0.921 | 201] 1.5 [DL + LL] | 6360.6281 | -60.3299 | -7.2338 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6296.8594 | 2.6596 | -3.1251 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6360.6281 | -7.2338 | -3.1251 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.956 | 201] 1.5 [DL + LL] | 6606.7922 | 62.7782 | 14.0258 |
| Bottom | 0.967 | 201] 1.5 [DL + LL] | 6672.5853 | -66.7089 | -39.7433 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6606.7922 | 14.0258 | -16.5541 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6672.5853 | -39.7433 | -16.5541 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.12 | 201] 1.5 [DL + LL] | 6901.3808 | 224.1275 | 44.2343 |
| Bottom | 1.135 | 201] 1.5 [DL + LL] | 6986.4057 | -226.6272 | -54.3119 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6901.3808 | 44.2343 | -23.4999 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6986.4057 | -54.3119 | -23.4999 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.13 | 201] 1.5 [DL + LL] | 7154.8125 | 205.6597 | 51.7384 |
| Bottom | 1.138 | 201] 1.5 [DL + LL] | 7236.1935 | -207.8516 | -15.7558 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7154.8125 | 51.7384 | -16.8076 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7236.1935 | -15.7558 | -16.8076 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.411 | 201] 1.5 [DL + LL] | 1593.9708 | 32.6354 | -206.5988 |
| Bottom | 0.365 | 201] 1.5 [DL + LL] | 1636.4832 | -28.2304 | -0.2024 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1593.9708 | -206.5988 | 65.4174 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1636.4832 | -0.2024 | 65.4174 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.406 | 201] 1.5 [DL + LL] | 1810.4265 | 25.8832 | 79.7852 |
| Bottom | 0.414 | 201] 1.5 [DL + LL] | 1852.939 | -27.1144 | -38.1907 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1810.4265 | 79.7852 | -37.6076 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1852.939 | -38.1907 | -37.6076 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.451 | 201] 1.5 [DL + LL] | 2028.5746 | 27.5802 | 45.739 |
| Bottom | 0.459 | 201] 1.5 [DL + LL] | 2071.087 | -27.6878 | -41.7387 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2028.5746 | 45.739 | -27.891 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2071.087 | -41.7387 | -27.891 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.496 | 201] 1.5 [DL + LL] | 2247.9548 | 28.7128 | 42.9286 |
| Bottom | 0.504 | 201] 1.5 [DL + LL] | 2290.4673 | -28.6131 | -41.4012 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2247.9548 | 42.9286 | -26.8977 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2290.4673 | -41.4012 | -26.8977 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 201] 1.5 [DL + LL] | 2468.3645 | 29.6375 | 43.4545 |
| Bottom | 0.549 | 201] 1.5 [DL + LL] | 2510.8769 | -29.4796 | -41.3773 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2468.3645 | 43.4545 | -27.0628 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2510.8769 | -41.3773 | -27.0628 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.586 | 201] 1.5 [DL + LL] | 2689.5506 | 30.4095 | 43.4431 |
| Bottom | 0.594 | 201] 1.5 [DL + LL] | 2732.0631 | -30.2135 | -41.3202 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2689.5506 | 43.4431 | -27.0449 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2732.0631 | -41.3202 | -27.0449 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.604 | 201] 1.5 [DL + LL] | 2911.2529 | 31.0909 | 43.2135 |
| Bottom | 0.612 | 201] 1.5 [DL + LL] | 2953.7654 | -30.8412 | -41.2494 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2911.2529 | 43.2135 | -26.9526 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2953.7654 | -41.2494 | -26.9526 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.649 | 201] 1.5 [DL + LL] | 3133.2116 | 31.6816 | 42.7192 |
| Bottom | 0.658 | 201] 1.5 [DL + LL] | 3175.724 | -31.3437 | -41.2988 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3133.2116 | 42.7192 | -26.8151 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3175.724 | -41.2988 | -26.8151 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 201] 1.5 [DL + LL] | 3355.1587 | 32.2383 | 41.7769 |
| Bottom | 0.719 | 201] 1.5 [DL + LL] | 3397.6711 | -31.945 | -40.4231 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3355.1587 | 41.7769 | -26.2438 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3397.6711 | -40.4231 | -26.2438 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.756 | 201] 1.5 [DL + LL] | 3576.7872 | 32.3823 | 41.471 |
| Bottom | 0.765 | 201] 1.5 [DL + LL] | 3619.2996 | -31.3876 | -38.002 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3576.7872 | 41.471 | -25.3788 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3619.2996 | -38.002 | -25.3788 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.785 | 201] 1.5 [DL + LL] | 3798.064 | 34.2404 | 42.5056 |
| Bottom | 0.79 | 201] 1.5 [DL + LL] | 3840.5765 | -34.2167 | -82.629 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3798.064 | 42.5056 | -39.9378 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3840.5765 | -82.629 | -39.9378 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.832 | 201] 1.5 [DL + LL] | 4019.2155 | 32.4725 | -6.193 |
| Bottom | 0.841 | 201] 1.5 [DL + LL] | 4061.7279 | -30.4947 | 217.878 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4019.2155 | -6.193 | 71.0209 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4061.7279 | 217.878 | 71.0209 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.723 | 201] 1.5 [DL + LL] | 4240.6991 | 68.2822 | -902.4439 |
| Bottom | 0.632 | 201] 1.5 [DL + LL] | 4304.4678 | -61.2068 | -21.7106 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4240.6991 | -902.4439 | 279.6758 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4304.4678 | -21.7106 | 279.6758 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.664 | 201] 1.5 [DL + LL] | 4501.3032 | 68.3808 | 80.1783 |
| Bottom | 0.671 | 201] 1.5 [DL + LL] | 4565.0719 | -66.1697 | -17.9763 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4501.3032 | 80.1783 | -31.4466 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4565.0719 | -17.9763 | -31.4466 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.695 | 201] 1.5 [DL + LL] | 4760.1586 | 63.6223 | 81.6683 |
| Bottom | 0.705 | 201] 1.5 [DL + LL] | 4823.9273 | -63.4554 | -43.7952 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4760.1586 | 81.6683 | -40.0099 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4823.9273 | -43.7952 | -40.0099 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.732 | 201] 1.5 [DL + LL] | 5016.031 | 63.255 | 53.3322 |
| Bottom | 0.741 | 201] 1.5 [DL + LL] | 5079.7997 | -62.3084 | -42.0882 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5016.031 | 53.3322 | -30.4452 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5079.7997 | -42.0882 | -30.4452 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.767 | 201] 1.5 [DL + LL] | 5269.4499 | 62.5249 | 51.8313 |
| Bottom | 0.776 | 201] 1.5 [DL + LL] | 5333.2186 | -61.3748 | -41.127 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5269.4499 | 51.8313 | -29.6492 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5333.2186 | -41.127 | -29.6492 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.802 | 201] 1.5 [DL + LL] | 5520.4501 | 61.7241 | 49.5012 |
| Bottom | 0.811 | 201] 1.5 [DL + LL] | 5584.2188 | -60.3451 | -42.1053 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5520.4501 | 49.5012 | -29.2078 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5584.2188 | -42.1053 | -29.2078 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.837 | 201] 1.5 [DL + LL] | 5768.8688 | 61.1014 | 44.9085 |
| Bottom | 0.845 | 201] 1.5 [DL + LL] | 5832.6375 | -59.7536 | -43.2396 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5768.8688 | 44.9085 | -28.1094 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5832.6375 | -43.2396 | -28.1094 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.871 | 201] 1.5 [DL + LL] | 6014.4135 | 59.7802 | 39.6742 |
| Bottom | 0.878 | 201] 1.5 [DL + LL] | 6078.1821 | -56.6137 | -39.0877 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6014.4135 | 39.6742 | -25.142 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6078.1821 | -39.0877 | -25.142 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.906 | 201] 1.5 [DL + LL] | 6257.2431 | 62.8046 | 39.6445 |
| Bottom | 0.92 | 201] 1.5 [DL + LL] | 6323.0362 | -70.2475 | -16.892 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6257.2431 | 39.6445 | -17.5242 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6323.0362 | -16.892 | -17.5242 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.06 | 201] 1.5 [DL + LL] | 6522.4964 | 212.3373 | 43.063 |
| Bottom | 1.07 | 201] 1.5 [DL + LL] | 6607.5213 | -214.837 | 17.8304 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6522.4964 | 43.063 | -6.0103 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6607.5213 | 17.8304 | -6.0103 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.063 | 201] 1.5 [DL + LL] | 6755.1494 | 192.0179 | 36.9283 |
| Bottom | 1.078 | 201] 1.5 [DL + LL] | 6836.5304 | -194.2098 | -61.2974 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6755.1494 | 36.9283 | -24.3006 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6836.5304 | -61.2974 | -24.3006 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 201] 1.5 [DL + LL] | 1384.7623 | -80.668 | 241.9552 |
| Bottom | 0.423 | 201] 1.5 [DL + LL] | 1427.2748 | 70.8485 | -37.2718 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1384.7623 | 241.9552 | -88.875 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1427.2748 | -37.2718 | -88.875 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.437 | 201] 1.5 [DL + LL] | 1660.8269 | -62.7761 | 14.2282 |
| Bottom | 0.451 | 201] 1.5 [DL + LL] | 1703.3393 | 64.7529 | -21.0785 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1660.8269 | 14.2282 | -11.3747 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1703.3393 | -21.0785 | -11.3747 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.496 | 201] 1.5 [DL + LL] | 1933.9031 | -65.6327 | 31.021 |
| Bottom | 0.5 | 201] 1.5 [DL + LL] | 1976.4155 | 65.4745 | -24.5853 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1933.9031 | 31.021 | -17.834 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1976.4155 | -24.5853 | -17.834 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 201] 1.5 [DL + LL] | 2206.3887 | -65.2111 | 28.8904 |
| Bottom | 0.551 | 201] 1.5 [DL + LL] | 2248.9011 | 65.3451 | -25.472 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2206.3887 | 28.8904 | -17.4485 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2248.9011 | -25.472 | -17.4485 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.585 | 201] 1.5 [DL + LL] | 2478.6099 | -65.6136 | 28.6246 |
| Bottom | 0.593 | 201] 1.5 [DL + LL] | 2521.1223 | 65.685 | -25.7309 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2478.6099 | 28.6246 | -17.4575 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2521.1223 | -25.7309 | -17.4575 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.637 | 201] 1.5 [DL + LL] | 2750.8294 | -65.9766 | 28.6275 |
| Bottom | 0.645 | 201] 1.5 [DL + LL] | 2793.3418 | 66.1113 | -25.8331 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2750.8294 | 28.6275 | -17.5007 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2793.3418 | -25.8331 | -17.5007 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.685 | 201] 1.5 [DL + LL] | 3023.2953 | -66.5062 | 28.5259 |
| Bottom | 0.692 | 201] 1.5 [DL + LL] | 3065.8077 | 66.6827 | -25.8353 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3023.2953 | 28.5259 | -17.4772 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3065.8077 | -25.8353 | -17.4772 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 201] 1.5 [DL + LL] | 3296.2702 | -67.1731 | 28.2744 |
| Bottom | 0.744 | 201] 1.5 [DL + LL] | 3338.7826 | 67.3879 | -25.847 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3296.2702 | 28.2744 | -17.408 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3338.7826 | -25.847 | -17.408 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.768 | 201] 1.5 [DL + LL] | 3570.0247 | -67.9939 | 27.7346 |
| Bottom | 0.776 | 201] 1.5 [DL + LL] | 3612.5372 | 68.3119 | -25.6746 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3570.0247 | 27.7346 | -17.189 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3612.5372 | -25.6746 | -17.189 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.819 | 201] 1.5 [DL + LL] | 3844.7651 | -68.7938 | 27.0577 |
| Bottom | 0.827 | 201] 1.5 [DL + LL] | 3887.2775 | 68.7917 | -25.1875 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3844.7651 | 27.0577 | -16.8271 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3887.2775 | -25.1875 | -16.8271 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.875 | 201] 1.5 [DL + LL] | 4121.0094 | -70.8486 | 26.7622 |
| Bottom | 0.885 | 201] 1.5 [DL + LL] | 4163.5218 | 72.0673 | 22.5236 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4121.0094 | 26.7622 | -1.5031 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4163.5218 | 22.5236 | -1.5031 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 201] 1.5 [DL + LL] | 4400.9339 | -69.2119 | 81.035 |
| Bottom | 0.959 | 201] 1.5 [DL + LL] | 4443.4463 | 65.7516 | -287.9606 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4400.9339 | 81.035 | -117.3667 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4443.4463 | -287.9606 | -117.3667 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.816 | 201] 1.5 [DL + LL] | 4635.857 | -73.3357 | 1102.2587 |
| Bottom | 0.689 | 201] 1.5 [DL + LL] | 4699.6257 | 69.2272 | -70.8265 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4635.857 | 1102.2587 | -372.9471 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4699.6257 | -70.8265 | -372.9471 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.719 | 201] 1.5 [DL + LL] | 4898.5293 | -70.5138 | 42.1904 |
| Bottom | 0.726 | 201] 1.5 [DL + LL] | 4962.298 | 69.3584 | -80.9113 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4898.5293 | 42.1904 | -39.1632 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4962.298 | -80.9113 | -39.1632 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.755 | 201] 1.5 [DL + LL] | 5159.9064 | -68.1943 | 23.8657 |
| Bottom | 0.763 | 201] 1.5 [DL + LL] | 5223.6751 | 67.79 | -47.2175 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5159.9064 | 23.8657 | -22.7556 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5223.6751 | -47.2175 | -22.7556 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.79 | 201] 1.5 [DL + LL] | 5419.8971 | -66.5945 | 50.1942 |
| Bottom | 0.799 | 201] 1.5 [DL + LL] | 5483.6657 | 66.0905 | -41.0156 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5419.8971 | 50.1942 | -29.1587 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5483.6657 | -41.0156 | -29.1587 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.826 | 201] 1.5 [DL + LL] | 5679.3006 | -65.355 | 51.5642 |
| Bottom | 0.835 | 201] 1.5 [DL + LL] | 5743.0693 | 64.6617 | -39.9577 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5679.3006 | 51.5642 | -29.2392 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5743.0693 | -39.9577 | -29.2392 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.862 | 201] 1.5 [DL + LL] | 5938.0965 | -63.9404 | 47.8411 |
| Bottom | 0.871 | 201] 1.5 [DL + LL] | 6001.8652 | 63.2033 | -39.0867 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5938.0965 | 47.8411 | -27.7635 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6001.8652 | -39.0867 | -27.7635 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.898 | 201] 1.5 [DL + LL] | 6196.1912 | -62.4642 | 43.3426 |
| Bottom | 0.906 | 201] 1.5 [DL + LL] | 6259.9599 | 61.5081 | -38.3763 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6196.1912 | 43.3426 | -26.1001 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6259.9599 | -38.3763 | -26.1001 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.933 | 201] 1.5 [DL + LL] | 6453.6925 | -61.3633 | 38.044 |
| Bottom | 0.942 | 201] 1.5 [DL + LL] | 6517.4612 | 60.3132 | -36.7557 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6453.6925 | 38.044 | -23.9044 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6517.4612 | -36.7557 | -23.9044 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.969 | 201] 1.5 [DL + LL] | 6710.2729 | -59.3333 | 33.2751 |
| Bottom | 0.979 | 201] 1.5 [DL + LL] | 6776.0659 | 59.9749 | -13.41 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6710.2729 | 33.2751 | -14.5155 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6776.0659 | -13.41 | -14.5155 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.136 | 201] 1.5 [DL + LL] | 6966.9412 | -230.1449 | 49.1939 |
| Bottom | 1.147 | 201] 1.5 [DL + LL] | 7051.9661 | 232.6447 | -22.821 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6966.9412 | 49.1939 | -17.1845 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7051.9661 | -22.821 | -17.1845 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.109 | 201] 1.5 [DL + LL] | 7290.1416 | -175.8711 | 41.6587 |
| Bottom | 1.12 | 201] 1.5 [DL + LL] | 7371.5226 | 178.0631 | -30.5857 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7290.1416 | 41.6587 | -17.9283 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7371.5226 | -30.5857 | -17.9283 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.29 | 201] 1.5 [DL + LL] | 545.9012 | 207.1016 | 453.1576 |
| Bottom | 0.201 | 201] 1.5 [DL + LL] | 833.1712 | -109.7132 | 110.6812 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 545.9012 | 453.1576 | -78.5396 | 3461.1684 | 4473.6241 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 833.1712 | 110.6812 | -78.5396 | 3461.1684 | 4473.6241 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.18 | 201] 1.5 [DL + LL] | 1176.1039 | 91.3751 | 1050.7738 |
| Bottom | 0.672 | 201] 1.5 [DL + LL] | 1370.0275 | -200.9627 | 950.6597 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1176.1039 | 1050.7738 | -34.2724 | 3834.4961 | 4846.9518 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1370.0275 | 950.6597 | -34.2724 | 3834.4961 | 4846.9518 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.448 | 201] 1.5 [DL + LL] | 2578.6618 | 261.7814 | 1320.5923 |
| Bottom | 0.257 | 201] 1.5 [DL + LL] | 2790.3421 | -184.3209 | 1054.8145 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2578.6618 | 1320.5923 | -82.9168 | 3768.7694 | 4781.225 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2790.3421 | 1054.8145 | -82.3709 | 3768.7694 | 4781.225 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.214 | 201] 1.5 [DL + LL] | 3045.2841 | 133.9322 | 1117.0699 |
| Bottom | 0.245 | 201] 1.5 [DL + LL] | 3273.335 | -179.6644 | 833.4436 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3045.2841 | 1117.0699 | -73.8422 | 3795.0601 | 4807.5157 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3273.335 | 833.4436 | -73.9102 | 3795.0601 | 4807.5157 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.254 | 201] 1.5 [DL + LL] | 3592.6042 | 179.6356 | 853.8499 |
| Bottom | 0.257 | 201] 1.5 [DL + LL] | 3824.6068 | -184.4618 | 649.0676 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3592.6042 | 853.8499 | -47.2786 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3824.6068 | 649.0676 | -47.1389 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.259 | 201] 1.5 [DL + LL] | 4148.1363 | 173.8331 | 682.9352 |
| Bottom | 0.27 | 201] 1.5 [DL + LL] | 4380.7442 | -183.6146 | 548.8444 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4148.1363 | 682.9352 | -24.4011 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4380.7442 | 548.8444 | -24.2687 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.276 | 201] 1.5 [DL + LL] | 4707.0652 | 171.0541 | 591.9047 |
| Bottom | 0.289 | 201] 1.5 [DL + LL] | 4940.1888 | -184.3148 | 499.4147 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4707.0652 | 591.9047 | -10.8008 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4940.1888 | 499.4147 | -10.7103 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.293 | 201] 1.5 [DL + LL] | 5269.4117 | 167.6954 | 551.2383 |
| Bottom | 0.306 | 201] 1.5 [DL + LL] | 5502.8855 | -177.4543 | 482.2458 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5269.4117 | 551.2383 | -3.058 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5502.8855 | 482.2458 | -3.0121 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.318 | 201] 1.5 [DL + LL] | 5847.9289 | 172.7742 | 604.0947 |
| Bottom | 0.327 | 201] 1.5 [DL + LL] | 6081.0267 | -188.5997 | 238.8851 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5847.9289 | 604.0947 | -97.3282 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6081.0267 | 238.8851 | -97.3043 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.334 | 201] 1.5 [DL + LL] | 6436.0571 | 163.352 | 395.07 |
| Bottom | 0.347 | 201] 1.5 [DL + LL] | 6669.564 | -181.0487 | 189.2303 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6436.0571 | 395.07 | -46.4373 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6669.564 | 189.2303 | -46.4241 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.359 | 201] 1.5 [DL + LL] | 7024.1196 | 166.4645 | 343.7149 |
| Bottom | 0.37 | 201] 1.5 [DL + LL] | 7258.0593 | -179.3266 | 153.8065 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7024.1196 | 343.7149 | -41.0667 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7258.0593 | 153.8065 | -41.0492 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.381 | 201] 1.5 [DL + LL] | 7612.5878 | 163.4241 | 309.6295 |
| Bottom | 0.393 | 201] 1.5 [DL + LL] | 7846.97 | -177.3506 | 126.6293 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7612.5878 | 309.6295 | -38.5495 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7846.97 | 126.6293 | -38.5331 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.403 | 201] 1.5 [DL + LL] | 8200.6141 | 159.4011 | 282.2157 |
| Bottom | 0.415 | 201] 1.5 [DL + LL] | 8435.4247 | -174.7062 | 104.2297 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8200.6141 | 282.2157 | -36.6417 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8435.4247 | 104.2297 | -36.6295 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.425 | 201] 1.5 [DL + LL] | 8787.6547 | 155.2361 | 258.7294 |
| Bottom | 0.438 | 201] 1.5 [DL + LL] | 9022.8763 | -171.5182 | 87.3454 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8787.6547 | 258.7294 | -34.242 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9022.8763 | 87.3454 | -34.2348 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.447 | 201] 1.5 [DL + LL] | 9373.181 | 150.8048 | 239.9673 |
| Bottom | 0.46 | 201] 1.5 [DL + LL] | 9608.79 | -167.8481 | 76.7309 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9373.181 | 239.9673 | -31.3691 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9608.79 | 76.7309 | -31.3664 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.468 | 201] 1.5 [DL + LL] | 9956.6759 | 146.0165 | 226.7507 |
| Bottom | 0.482 | 201] 1.5 [DL + LL] | 10192.6433 | -163.6465 | 71.1846 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9956.6759 | 226.7507 | -28.668 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10192.6433 | 71.1846 | -28.6692 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.493 | 201] 1.5 [DL + LL] | 10537.6298 | 140.8966 | 217.9324 |
| Bottom | 0.507 | 201] 1.5 [DL + LL] | 10773.9218 | -159.0468 | 66.2247 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10537.6298 | 217.9324 | -27.2 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10773.9218 | 66.2247 | -27.2047 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.518 | 201] 1.5 [DL + LL] | 11115.5578 | 135.3451 | 209.0728 |
| Bottom | 0.531 | 201] 1.5 [DL + LL] | 11352.1331 | -154.1942 | 49.5885 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11115.5578 | 209.0728 | -29.4531 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11352.1331 | 49.5885 | -29.4618 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 201] 1.5 [DL + LL] | 11689.82 | 128.862 | 187.6067 |
| Bottom | 0.554 | 201] 1.5 [DL + LL] | 11926.6426 | -144.1485 | 29.8531 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11689.82 | 187.6067 | -28.7168 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11926.6426 | 29.8531 | -28.731 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.567 | 201] 1.5 [DL + LL] | 12259.3705 | 125.8656 | 162.0007 |
| Bottom | 0.578 | 201] 1.5 [DL + LL] | 12496.3792 | -137.8941 | 61.8923 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12259.3705 | 162.0007 | -10.2813 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12496.3792 | 61.8923 | -10.3086 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.593 | 201] 1.5 [DL + LL] | 12828.239 | 126.0521 | 190.1503 |
| Bottom | 0.606 | 201] 1.5 [DL + LL] | 13065.3583 | -149.7908 | 94.9678 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12828.239 | 190.1503 | -8.6281 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13065.3583 | 94.9678 | -8.6554 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 201] 1.5 [DL + LL] | 13394.6369 | 103.4011 | 231.3323 |
| Bottom | 0.629 | 201] 1.5 [DL + LL] | 13632.1544 | -139.4487 | 114.1705 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13394.6369 | 231.3323 | -15.2806 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13632.1544 | 114.1705 | -15.3149 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.638 | 201] 1.5 [DL + LL] | 13961.2397 | 106.8821 | 255.9544 |
| Bottom | 0.653 | 201] 1.5 [DL + LL] | 14199.112 | -134.8638 | 88.67 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13961.2397 | 255.9544 | -30.8854 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14199.112 | 88.67 | -30.9237 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.664 | 201] 1.5 [DL + LL] | 14528.4486 | 105.47 | 237.3953 |
| Bottom | 0.678 | 201] 1.5 [DL + LL] | 14766.6706 | -131.7043 | 84.0579 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14528.4486 | 237.3953 | -26.1662 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14766.6706 | 84.0579 | -26.2066 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.688 | 201] 1.5 [DL + LL] | 15095.6683 | 101.346 | 238.9327 |
| Bottom | 0.703 | 201] 1.5 [DL + LL] | 15334.2233 | -128.3268 | 105.1632 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15095.6683 | 238.9327 | -19.6732 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15334.2233 | 105.1632 | -19.7148 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.713 | 201] 1.5 [DL + LL] | 15662.5632 | 96.6131 | 265.9247 |
| Bottom | 0.728 | 201] 1.5 [DL + LL] | 15901.4414 | -124.4768 | 155.557 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15662.5632 | 265.9247 | -11.9572 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15901.4414 | 155.557 | -11.9994 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.726 | 201] 1.5 [DL + LL] | 16228.8702 | 91.6111 | 322.2222 |
| Bottom | 0.741 | 201] 1.5 [DL + LL] | 16468.0621 | -119.7162 | 245.7105 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16228.8702 | 322.2222 | -0.904 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16468.0621 | 245.7105 | -0.9447 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.75 | 201] 1.5 [DL + LL] | 16794.3711 | 86.6362 | 418.6704 |
| Bottom | 0.764 | 201] 1.5 [DL + LL] | 17033.8671 | -110.1768 | 368.4093 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16794.3711 | 418.6704 | 7.7752 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17033.8671 | 368.4093 | 7.7397 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.775 | 201] 1.5 [DL + LL] | 17358.5275 | 85.2546 | 547.5237 |
| Bottom | 0.787 | 201] 1.5 [DL + LL] | 17604.8147 | -91.2239 | 432.2759 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17358.5275 | 547.5237 | -12.0969 | 3755.624 | 4768.0797 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17604.8147 | 432.2759 | -12.0858 | 3755.624 | 4768.0797 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 201] 1.5 [DL + LL] | 18095.1281 | 488.4997 | 145.5429 |
| Bottom | 0.93 | 201] 1.5 [DL + LL] | 18404.3228 | -497.59 | 315.511 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18095.1281 | 145.5429 | 58.997 | 3505.8626 | 4518.3182 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18404.3228 | 315.511 | 58.9606 | 3505.8626 | 4518.3182 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.979 | 201] 1.5 [DL + LL] | 18950.2381 | 567.5444 | -313.0108 |
| Bottom | 0.999 | 201] 1.5 [DL + LL] | 19248.2053 | -575.5699 | -612.5619 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18950.2381 | -313.0108 | -54.8239 | 3553.1858 | 4565.6414 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 19248.2053 | -612.5619 | -54.7462 | 3553.1858 | 4565.6414 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.209 | 201] 1.5 [DL + LL] | 605.2558 | -193.6188 | 558.2763 |
| Bottom | 0.096 | 201] 1.5 [DL + LL] | 892.5258 | 70.1698 | 300.6598 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 605.2558 | 558.2763 | -59.0959 | 3461.1684 | 4473.624 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 892.5258 | 300.6598 | -59.0959 | 3461.1684 | 4473.624 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.075 | 201] 1.5 [DL + LL] | 1148.2795 | -23.072 | 891.655 |
| Bottom | 0.085 | 201] 1.5 [DL + LL] | 1342.2032 | 37.8036 | 675.1032 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1148.2795 | 891.655 | -73.6371 | 3834.4961 | 4846.9517 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1342.2032 | 675.1032 | -73.6371 | 3834.4961 | 4846.9517 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.085 | 201] 1.5 [DL + LL] | 1838.472 | -8.2934 | 347.8708 |
| Bottom | 0.151 | 201] 1.5 [DL + LL] | 2057.742 | 117.0815 | 316.0775 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1838.472 | 347.8708 | -3.5161 | 3768.7694 | 4781.225 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2057.742 | 316.0775 | -4.0621 | 3768.7694 | 4781.225 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.163 | 201] 1.5 [DL + LL] | 2347.894 | -114.2577 | 537.7703 |
| Bottom | 0.187 | 201] 1.5 [DL + LL] | 2594.976 | 146.1964 | 328.7031 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2347.894 | 537.7703 | -35.4094 | 3795.0601 | 4807.5157 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2594.976 | 328.7031 | -35.3414 | 3795.0601 | 4807.5157 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.195 | 201] 1.5 [DL + LL] | 2941.9687 | -139.2521 | 484.2388 |
| Bottom | 0.203 | 201] 1.5 [DL + LL] | 3191.6726 | 146.8709 | 354.7511 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2941.9687 | 484.2388 | -10.0402 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3191.6726 | 354.7511 | -10.1799 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.214 | 201] 1.5 [DL + LL] | 3537.2971 | -138.9968 | 506.5967 |
| Bottom | 0.226 | 201] 1.5 [DL + LL] | 3786.3958 | 149.4922 | 374.8394 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3537.2971 | 506.5967 | -11.2521 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3786.3958 | 374.8394 | -11.3845 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.235 | 201] 1.5 [DL + LL] | 4130.8193 | -136.1082 | 523.4194 |
| Bottom | 0.249 | 201] 1.5 [DL + LL] | 4379.4022 | 151.226 | 386.757 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4130.8193 | 523.4194 | -13.2349 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4379.4022 | 386.757 | -13.3254 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.255 | 201] 1.5 [DL + LL] | 4723.1612 | -133.5276 | 534.3576 |
| Bottom | 0.268 | 201] 1.5 [DL + LL] | 4971.3939 | 148.6173 | 383.3105 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4723.1612 | 534.3576 | -18.0906 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4971.3939 | 383.3105 | -18.1364 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.28 | 201] 1.5 [DL + LL] | 5328.2074 | -133.8142 | 595.4501 |
| Bottom | 0.292 | 201] 1.5 [DL + LL] | 5576.8162 | 154.036 | 167.5063 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5328.2074 | 595.4501 | -105.7098 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5576.8162 | 167.5063 | -105.7337 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.3 | 201] 1.5 [DL + LL] | 5940.2118 | -128.1892 | 410.3689 |
| Bottom | 0.313 | 201] 1.5 [DL + LL] | 6188.4113 | 147.7033 | 119.5828 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5940.2118 | 410.3689 | -62.4897 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6188.4113 | 119.5828 | -62.503 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.326 | 201] 1.5 [DL + LL] | 6549.3225 | -131.9885 | 355.4333 |
| Bottom | 0.337 | 201] 1.5 [DL + LL] | 6797.0894 | 146.7727 | 93.5702 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6549.3225 | 355.4333 | -53.636 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6797.0894 | 93.5702 | -53.6535 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.349 | 201] 1.5 [DL + LL] | 7156.2545 | -130.1097 | 325.8921 |
| Bottom | 0.361 | 201] 1.5 [DL + LL] | 7403.5788 | 145.9179 | 74.9177 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7156.2545 | 325.8921 | -50.5142 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7403.5788 | 74.9177 | -50.5307 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.373 | 201] 1.5 [DL + LL] | 7760.4973 | -127.3028 | 302.7805 |
| Bottom | 0.385 | 201] 1.5 [DL + LL] | 8007.3933 | 144.4957 | 58.2379 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7760.4973 | 302.7805 | -48.7961 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8007.3933 | 58.2379 | -48.8082 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.396 | 201] 1.5 [DL + LL] | 8361.7696 | -124.4224 | 281.323 |
| Bottom | 0.408 | 201] 1.5 [DL + LL] | 8608.2545 | 142.6257 | 44.304 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8361.7696 | 281.323 | -46.7176 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8608.2545 | 44.304 | -46.7248 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.42 | 201] 1.5 [DL + LL] | 8959.7586 | -121.3197 | 262.2227 |
| Bottom | 0.434 | 201] 1.5 [DL + LL] | 9205.8562 | 140.3528 | 34.3133 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8959.7586 | 262.2227 | -44.1169 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9205.8562 | 34.3133 | -44.1195 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.446 | 201] 1.5 [DL + LL] | 9554.1381 | -117.9082 | 246.6613 |
| Bottom | 0.459 | 201] 1.5 [DL + LL] | 9799.8773 | 137.6244 | 27.4014 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9554.1381 | 246.6613 | -41.6395 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9799.8773 | 27.4014 | -41.6383 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.472 | 201] 1.5 [DL + LL] | 10144.5687 | -114.2067 | 233.7594 |
| Bottom | 0.484 | 201] 1.5 [DL + LL] | 10389.9833 | 134.5794 | 19.175 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10144.5687 | 233.7594 | -40.397 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10389.9833 | 19.175 | -40.3923 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.497 | 201] 1.5 [DL + LL] | 10730.715 | -110.0847 | 219.1185 |
| Bottom | 0.509 | 201] 1.5 [DL + LL] | 10975.8463 | 131.2961 | -1.5658 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10730.715 | 219.1185 | -42.5437 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10975.8463 | -1.5658 | -42.5351 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.522 | 201] 1.5 [DL + LL] | 11312.1278 | -105.2687 | 191.2289 |
| Bottom | 0.533 | 201] 1.5 [DL + LL] | 11557.0117 | 123.2608 | -23.9517 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11312.1278 | 191.2289 | -40.9861 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11557.0117 | -23.9517 | -40.9719 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.547 | 201] 1.5 [DL + LL] | 11888.0286 | -103.7351 | 160.9481 |
| Bottom | 0.557 | 201] 1.5 [DL + LL] | 12132.7264 | 118.5124 | 14.5336 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11888.0286 | 160.9481 | -19.3153 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12132.7264 | 14.5336 | -19.288 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.573 | 201] 1.5 [DL + LL] | 12461.9998 | -103.9467 | 191.9557 |
| Bottom | 0.586 | 201] 1.5 [DL + LL] | 12706.5871 | 130.1183 | 72.6289 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12461.9998 | 191.9557 | -10.7984 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12706.5871 | 72.6289 | -10.771 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.596 | 201] 1.5 [DL + LL] | 13032.6177 | -84.1597 | 253.5145 |
| Bottom | 0.61 | 201] 1.5 [DL + LL] | 13276.8068 | 121.3325 | 96.2246 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13032.6177 | 253.5145 | -23.1168 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13276.8068 | 96.2246 | -23.0825 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.619 | 201] 1.5 [DL + LL] | 13601.4355 | -87.9936 | 278.0573 |
| Bottom | 0.635 | 201] 1.5 [DL + LL] | 13845.2697 | 117.2861 | 70.8008 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13601.4355 | 278.0573 | -39.1977 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13845.2697 | 70.8008 | -39.1594 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.645 | 201] 1.5 [DL + LL] | 14168.7473 | -87.2553 | 255.0223 |
| Bottom | 0.66 | 201] 1.5 [DL + LL] | 14412.2319 | 114.8712 | 65.044 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14168.7473 | 255.0223 | -33.9375 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14412.2319 | 65.044 | -33.8972 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.67 | 201] 1.5 [DL + LL] | 14734.0671 | -83.918 | 250.9217 |
| Bottom | 0.685 | 201] 1.5 [DL + LL] | 14977.2188 | 112.344 | 87.0801 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14734.0671 | 250.9217 | -25.8515 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14977.2188 | 87.0801 | -25.8099 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.694 | 201] 1.5 [DL + LL] | 15297.1228 | -80.0603 | 274.3612 |
| Bottom | 0.71 | 201] 1.5 [DL + LL] | 15539.9513 | 109.4467 | 140.5745 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15297.1228 | 274.3612 | -16.5015 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15539.9513 | 140.5745 | -16.4593 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.708 | 201] 1.5 [DL + LL] | 15857.6812 | -75.9459 | 329.2695 |
| Bottom | 0.723 | 201] 1.5 [DL + LL] | 16100.1959 | 105.5871 | 234.9243 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15857.6812 | 329.2695 | -4.1373 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16100.1959 | 234.9243 | -4.0965 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.732 | 201] 1.5 [DL + LL] | 16415.5392 | -72.1198 | 425.2884 |
| Bottom | 0.746 | 201] 1.5 [DL + LL] | 16657.7497 | 97.9808 | 362.0216 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16415.5392 | 425.2884 | 5.6301 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16657.7497 | 362.0216 | 5.6655 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.755 | 201] 1.5 [DL + LL] | 16970.0957 | -70.3767 | 554.3286 |
| Bottom | 0.767 | 201] 1.5 [DL + LL] | 17218.6624 | 75.0515 | 429.5749 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16970.0957 | 554.3286 | -13.3678 | 3755.624 | 4768.0797 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17218.6624 | 429.5749 | -13.3789 | 3755.624 | 4768.0797 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.925 | 201] 1.5 [DL + LL] | 17698.9468 | -562.3958 | 137.7382 |
| Bottom | 0.944 | 201] 1.5 [DL + LL] | 18009.5061 | 571.5262 | 331.8563 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17698.9468 | 137.7382 | 65.475 | 3505.8625 | 4518.3182 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18009.5061 | 331.8563 | 65.5114 | 3505.8625 | 4518.3182 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.915 | 201] 1.5 [DL + LL] | 18580.7551 | -443.0477 | -366.1023 |
| Bottom | 0.935 | 201] 1.5 [DL + LL] | 18878.8765 | 451.0773 | -635.483 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18580.7551 | -366.1023 | -47.1524 | 3553.1858 | 4565.6414 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18878.8765 | -635.483 | -47.2301 | 3553.1858 | 4565.6414 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.525 | 201] 1.5 [DL + LL] | 1409.3026 | 74.3342 | 250.8247 |
| Bottom | 0.415 | 201] 1.5 [DL + LL] | 1451.8151 | -65.0449 | -42.6781 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1409.3026 | 250.8247 | -93.3437 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1451.8151 | -42.6781 | -93.3437 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.428 | 201] 1.5 [DL + LL] | 1678.9292 | 58.3008 | 10.3169 |
| Bottom | 0.443 | 201] 1.5 [DL + LL] | 1721.4417 | -59.9332 | -23.0774 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1678.9292 | 10.3169 | -10.7003 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1721.4417 | -23.0774 | -10.7003 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.487 | 201] 1.5 [DL + LL] | 1946.1483 | 61.1425 | 29.5516 |
| Bottom | 0.493 | 201] 1.5 [DL + LL] | 1988.6607 | -60.8781 | -25.6235 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1946.1483 | 29.5516 | -17.6304 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1988.6607 | -25.6235 | -17.6304 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.537 | 201] 1.5 [DL + LL] | 2213.1913 | 61.0553 | 28.12 |
| Bottom | 0.545 | 201] 1.5 [DL + LL] | 2255.7037 | -61.0563 | -26.177 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2213.1913 | 28.12 | -17.3578 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2255.7037 | -26.177 | -17.3578 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.579 | 201] 1.5 [DL + LL] | 2480.3629 | 61.7176 | 28.1575 |
| Bottom | 0.586 | 201] 1.5 [DL + LL] | 2522.8753 | -61.6609 | -26.3408 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2480.3629 | 28.1575 | -17.4288 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2522.8753 | -26.3408 | -17.4288 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.63 | 201] 1.5 [DL + LL] | 2747.8946 | 62.3448 | 28.3172 |
| Bottom | 0.638 | 201] 1.5 [DL + LL] | 2790.407 | -62.3408 | -26.4737 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2747.8946 | 28.3172 | -17.5273 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2790.407 | -26.4737 | -17.5273 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 201] 1.5 [DL + LL] | 3016.0133 | 63.1369 | 28.2778 |
| Bottom | 0.685 | 201] 1.5 [DL + LL] | 3058.5258 | -63.1588 | -26.5945 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3016.0133 | 28.2778 | -17.5578 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3058.5258 | -26.5945 | -17.5578 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.729 | 201] 1.5 [DL + LL] | 3284.9641 | 64.0703 | 27.9908 |
| Bottom | 0.737 | 201] 1.5 [DL + LL] | 3327.4766 | -64.108 | -26.795 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3284.9641 | 27.9908 | -17.5352 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3327.4766 | -26.795 | -17.5352 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.761 | 201] 1.5 [DL + LL] | 3555.004 | 65.1689 | 27.298 |
| Bottom | 0.769 | 201] 1.5 [DL + LL] | 3597.5165 | -65.2827 | -26.9235 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3555.004 | 27.298 | -17.364 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3597.5165 | -26.9235 | -17.364 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.813 | 201] 1.5 [DL + LL] | 3826.3276 | 66.2581 | 26.2591 |
| Bottom | 0.821 | 201] 1.5 [DL + LL] | 3868.84 | -65.9998 | -26.6848 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3826.3276 | 26.2591 | -16.9714 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3868.84 | -26.6848 | -16.9714 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.869 | 201] 1.5 [DL + LL] | 4099.4628 | 68.6694 | 25.5011 |
| Bottom | 0.879 | 201] 1.5 [DL + LL] | 4141.9752 | -69.6786 | 19.5909 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4099.4628 | 25.5011 | -1.9703 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4141.9752 | 19.5909 | -1.9703 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.929 | 201] 1.5 [DL + LL] | 4376.5553 | 67.1349 | 77.7981 |
| Bottom | 0.949 | 201] 1.5 [DL + LL] | 4419.0677 | -62.9128 | -287.4222 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4376.5553 | 77.7981 | -116.1305 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4419.0677 | -287.4222 | -116.1305 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.809 | 201] 1.5 [DL + LL] | 4609.0513 | 71.1099 | 1092.9193 |
| Bottom | 0.684 | 201] 1.5 [DL + LL] | 4672.82 | -66.6783 | -68.8955 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4609.0513 | 1092.9193 | -369.3464 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4672.82 | -68.8955 | -369.3464 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.714 | 201] 1.5 [DL + LL] | 4869.273 | 68.2871 | 40.9013 |
| Bottom | 0.721 | 201] 1.5 [DL + LL] | 4933.0417 | -66.9706 | -77.4023 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4869.273 | 40.9013 | -37.6205 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4933.0417 | -77.4023 | -37.6205 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.75 | 201] 1.5 [DL + LL] | 5128.3929 | 66.1946 | 24.8005 |
| Bottom | 0.758 | 201] 1.5 [DL + LL] | 5192.1616 | -65.6073 | -44.9014 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5128.3929 | 24.8005 | -22.2878 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5192.1616 | -44.9014 | -22.2878 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.785 | 201] 1.5 [DL + LL] | 5386.3078 | 64.7928 | 50.6517 |
| Bottom | 0.794 | 201] 1.5 [DL + LL] | 5450.0765 | -64.087 | -39.9579 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5386.3078 | 50.6517 | -28.9312 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5450.0765 | -39.9579 | -28.9312 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.82 | 201] 1.5 [DL + LL] | 5643.8248 | 63.7764 | 51.2773 |
| Bottom | 0.829 | 201] 1.5 [DL + LL] | 5707.5935 | -62.8466 | -39.9848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5643.8248 | 51.2773 | -29.1168 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5707.5935 | -39.9848 | -29.1168 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.856 | 201] 1.5 [DL + LL] | 5900.9468 | 62.5964 | 46.7807 |
| Bottom | 0.865 | 201] 1.5 [DL + LL] | 5964.7154 | -61.5935 | -40.0582 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5900.9468 | 46.7807 | -27.697 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5964.7154 | -40.0582 | -27.697 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.892 | 201] 1.5 [DL + LL] | 6157.601 | 61.3569 | 41.4628 |
| Bottom | 0.9 | 201] 1.5 [DL + LL] | 6221.3697 | -60.0689 | -40.0699 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6157.601 | 41.4628 | -26.0094 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6221.3697 | -40.0699 | -26.0094 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.928 | 201] 1.5 [DL + LL] | 6413.9256 | 60.5801 | 35.4031 |
| Bottom | 0.936 | 201] 1.5 [DL + LL] | 6477.6943 | -59.2331 | -38.9281 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6413.9256 | 35.4031 | -23.7358 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6477.6943 | -38.9281 | -23.7358 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.963 | 201] 1.5 [DL + LL] | 6669.6605 | 58.716 | 30.0591 |
| Bottom | 0.973 | 201] 1.5 [DL + LL] | 6735.4536 | -58.788 | -11.6473 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6669.6605 | 30.0591 | -12.9765 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6735.4536 | -11.6473 | -12.9765 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.069 | 201] 1.5 [DL + LL] | 6924.787 | 178.7518 | 49.0545 |
| Bottom | 1.079 | 201] 1.5 [DL + LL] | 7009.8119 | -181.2515 | -22.3822 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6924.787 | 49.0545 | -17.0389 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7009.8119 | -22.3822 | -17.0389 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.15 | 201] 1.5 [DL + LL] | 7240.6238 | 215.2018 | 40.762 |
| Bottom | 1.162 | 201] 1.5 [DL + LL] | 7322.0048 | -217.3937 | -31.7224 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7240.6238 | 40.762 | -17.9839 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7322.0048 | -31.7224 | -17.9839 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.557 | 201] 1.5 [DL + LL] | 1440.9395 | -91.4569 | 182.3573 |
| Bottom | 0.452 | 201] 1.5 [DL + LL] | 1483.452 | 79.9386 | 20.8239 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1440.9395 | 182.3573 | -51.5312 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1483.452 | 20.8239 | -51.5312 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.471 | 201] 1.5 [DL + LL] | 1712.5123 | -72.8788 | -17.4722 |
| Bottom | 0.481 | 201] 1.5 [DL + LL] | 1755.0247 | 74.0114 | 18.1517 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1712.5123 | -17.4722 | 11.1601 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1755.0247 | 18.1517 | 11.1601 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.519 | 201] 1.5 [DL + LL] | 1982.4522 | -73.5258 | -21.2734 |
| Bottom | 0.525 | 201] 1.5 [DL + LL] | 2024.9646 | 72.7285 | 22.3852 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1982.4522 | -21.2734 | 13.6866 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2024.9646 | 22.3852 | 13.6866 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.561 | 201] 1.5 [DL + LL] | 2250.511 | -71.4595 | -17.3738 |
| Bottom | 0.569 | 201] 1.5 [DL + LL] | 2293.0235 | 70.8928 | 21.2834 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2250.511 | -17.3738 | 12.0892 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2293.0235 | 21.2834 | 12.0892 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.61 | 201] 1.5 [DL + LL] | 2516.8423 | -70.0973 | -18.634 |
| Bottom | 0.617 | 201] 1.5 [DL + LL] | 2559.3548 | 69.4417 | 21.2155 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2516.8423 | -18.634 | 12.4596 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2559.3548 | 21.2155 | 12.4596 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.658 | 201] 1.5 [DL + LL] | 2781.5632 | -68.6448 | -18.9222 |
| Bottom | 0.666 | 201] 1.5 [DL + LL] | 2824.0757 | 68.0096 | 21.2465 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2781.5632 | -18.9222 | 12.5532 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2824.0757 | 21.2465 | 12.5532 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.669 | 201] 1.5 [DL + LL] | 3044.6978 | -67.2787 | -19.0802 |
| Bottom | 0.677 | 201] 1.5 [DL + LL] | 3087.2103 | 66.6326 | 21.2413 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3044.6978 | -19.0802 | 12.5958 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3087.2103 | 21.2413 | 12.5958 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.714 | 201] 1.5 [DL + LL] | 3306.2438 | -65.9391 | -19.2299 |
| Bottom | 0.722 | 201] 1.5 [DL + LL] | 3348.7562 | 65.2844 | 21.0043 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3306.2438 | -19.2299 | 12.5635 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3348.7562 | 21.0043 | 12.5635 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.78 | 201] 1.5 [DL + LL] | 3566.1698 | -64.5804 | -19.584 |
| Bottom | 0.787 | 201] 1.5 [DL + LL] | 3608.6822 | 63.9599 | 19.4862 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3566.1698 | -19.584 | 12.1868 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3608.6822 | 19.4862 | 12.1868 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.83 | 201] 1.5 [DL + LL] | 3824.4275 | -63.0726 | -21.3249 |
| Bottom | 0.837 | 201] 1.5 [DL + LL] | 3866.9399 | 62.1027 | 29.1158 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3824.4275 | -21.3249 | 15.7937 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3866.9399 | 29.1158 | 15.7937 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 201] 1.5 [DL + LL] | 4080.9161 | -62.5709 | -11.2013 |
| Bottom | 0.87 | 201] 1.5 [DL + LL] | 4123.4285 | 61.5168 | 61.026 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4080.9161 | -11.2013 | 22.8529 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4123.4285 | 61.026 | 22.8529 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 201] 1.5 [DL + LL] | 4333.2412 | -60.6629 | 26.5849 |
| Bottom | 0.937 | 201] 1.5 [DL + LL] | 4375.7537 | 61.2316 | -262.0042 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4333.2412 | 26.5849 | -91.8478 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4375.7537 | -262.0042 | -91.8478 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.83 | 201] 1.5 [DL + LL] | 4608.0346 | -100.3565 | 767.8878 |
| Bottom | 0.746 | 201] 1.5 [DL + LL] | 4668.2967 | 91.4473 | 65.2777 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4608.0346 | 767.8878 | -223.6695 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4668.2967 | 65.2777 | -223.6695 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.77 | 201] 1.5 [DL + LL] | 4889.3812 | -91.9045 | 27.1997 |
| Bottom | 0.776 | 201] 1.5 [DL + LL] | 4949.6433 | 90.9275 | -23.9899 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4889.3812 | 27.1997 | -16.2341 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4949.6433 | -23.9899 | -16.2341 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.811 | 201] 1.5 [DL + LL] | 5170.833 | -89.0114 | -64.5241 |
| Bottom | 0.816 | 201] 1.5 [DL + LL] | 5231.0951 | 88.182 | 17.6984 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5170.833 | -64.5241 | 25.9742 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5231.0951 | 17.6984 | 25.9742 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 201] 1.5 [DL + LL] | 5451.4033 | -86.6501 | -26.6884 |
| Bottom | 0.855 | 201] 1.5 [DL + LL] | 5511.6654 | 85.4285 | 27.9396 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5451.4033 | -26.6884 | 17.1645 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5511.6654 | 27.9396 | 17.1645 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.888 | 201] 1.5 [DL + LL] | 5730.3433 | -84.524 | -18.0616 |
| Bottom | 0.896 | 201] 1.5 [DL + LL] | 5790.6054 | 83.0521 | 26.8164 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5730.3433 | -18.0616 | 14.0884 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5790.6054 | 26.8164 | 14.0884 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.927 | 201] 1.5 [DL + LL] | 6007.5438 | -81.9032 | -20.7069 |
| Bottom | 0.935 | 201] 1.5 [DL + LL] | 6067.8059 | 80.2721 | 26.2278 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6007.5438 | -20.7069 | 14.7614 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6067.8059 | 26.2278 | 14.7614 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.967 | 201] 1.5 [DL + LL] | 6282.947 | -79.3047 | -23.2029 |
| Bottom | 0.975 | 201] 1.5 [DL + LL] | 6343.2092 | 77.8821 | 28.4908 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6282.947 | -23.2029 | 16.287 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6343.2092 | 28.4908 | 16.287 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.006 | 201] 1.5 [DL + LL] | 6556.4326 | -75.4898 | -23.085 |
| Bottom | 1.013 | 201] 1.5 [DL + LL] | 6616.6947 | 71.5017 | 20.8081 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6556.4326 | -23.085 | 13.8244 | 336.8722 | 631.5186 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6616.6947 | 20.8081 | 13.8244 | 336.8722 | 631.5186 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.047 | 201] 1.5 [DL + LL] | 6829.0481 | -78.9725 | -32.8582 |
| Bottom | 1.061 | 201] 1.5 [DL + LL] | 6891.2233 | 91.5262 | -67.7743 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6829.0481 | -32.8582 | -10.9908 | 321.6202 | 616.2666 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6891.2233 | -67.7743 | -10.9908 | 321.6202 | 616.2666 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.225 | 201] 1.5 [DL + LL] | 7317.9895 | -182.7728 | 169.2721 |
| Bottom | 1.236 | 201] 1.5 [DL + LL] | 7398.339 | 185.135 | -142.5519 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7317.9895 | 169.2721 | -74.3607 | 237.6067 | 532.2531 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7398.339 | -142.5519 | -74.3607 | 237.6067 | 532.2531 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.297 | 201] 1.5 [DL + LL] | 7831.4132 | -189.0375 | 120.0877 |
| Bottom | 1.3 | 201] 1.5 [DL + LL] | 7908.3192 | 191.1089 | -50.9542 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7831.4132 | 120.0877 | -42.5678 | 248.2394 | 542.8859 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7908.3192 | -50.9542 | -42.5678 | 248.2394 | 542.8859 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 201] 1.5 [DL + LL] | 2301.7301 | 62.0497 | 285.3656 |
| Bottom | 0.558 | 201] 1.5 [DL + LL] | 2344.2425 | -58.3687 | 28.2741 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2301.7301 | 285.3656 | -81.915 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2344.2425 | 28.2741 | -81.915 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.593 | 201] 1.5 [DL + LL] | 2486.0364 | 53.4882 | -126.0211 |
| Bottom | 0.593 | 201] 1.5 [DL + LL] | 2528.5489 | -54.1491 | 86.6139 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2486.0364 | -126.0211 | 67.3061 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2528.5489 | 86.6139 | 67.3061 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.625 | 201] 1.5 [DL + LL] | 2682.5569 | 55.2348 | -67.6147 |
| Bottom | 0.633 | 201] 1.5 [DL + LL] | 2725.0694 | -54.7582 | 76.5474 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2682.5569 | -67.6147 | 45.548 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2725.0694 | 76.5474 | 45.548 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.665 | 201] 1.5 [DL + LL] | 2888.5716 | 54.5282 | -71.6945 |
| Bottom | 0.673 | 201] 1.5 [DL + LL] | 2931.0841 | -54.2746 | 73.8736 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2888.5716 | -71.6945 | 46.001 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2931.0841 | 73.8736 | 46.001 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 201] 1.5 [DL + LL] | 3104.4399 | 53.9768 | -69.1256 |
| Bottom | 0.679 | 201] 1.5 [DL + LL] | 3146.9523 | -53.6533 | 71.0971 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3104.4399 | -69.1256 | 44.3033 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3146.9523 | 71.0971 | 44.3033 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.711 | 201] 1.5 [DL + LL] | 3330.1626 | 53.2396 | -66.7673 |
| Bottom | 0.719 | 201] 1.5 [DL + LL] | 3372.6751 | -52.8638 | 68.3834 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3330.1626 | -66.7673 | 42.692 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3372.6751 | 68.3834 | 42.692 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 201] 1.5 [DL + LL] | 3565.9903 | 52.3632 | -64.3149 |
| Bottom | 0.761 | 201] 1.5 [DL + LL] | 3608.5028 | -51.9318 | 65.6732 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3565.9903 | -64.3149 | 41.0516 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3608.5028 | 65.6732 | 41.0516 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.798 | 201] 1.5 [DL + LL] | 3812.2661 | 51.3323 | -61.7774 |
| Bottom | 0.805 | 201] 1.5 [DL + LL] | 3854.7786 | -50.8409 | 62.9562 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3812.2661 | -61.7774 | 39.3822 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3854.7786 | 62.9562 | 39.3822 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.848 | 201] 1.5 [DL + LL] | 4069.4633 | 50.1989 | -59.0894 |
| Bottom | 0.857 | 201] 1.5 [DL + LL] | 4111.9757 | -49.6506 | 60.3623 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4069.4633 | -59.0894 | 37.7048 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4111.9757 | 60.3623 | 37.7048 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.902 | 201] 1.5 [DL + LL] | 4338.1804 | 48.9262 | -56.0289 |
| Bottom | 0.911 | 201] 1.5 [DL + LL] | 4380.6928 | -48.3857 | 52.3523 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4338.1804 | -56.0289 | 34.1825 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4380.6928 | 52.3523 | 34.1825 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.957 | 201] 1.5 [DL + LL] | 4618.891 | 47.1482 | -58.9438 |
| Bottom | 0.962 | 201] 1.5 [DL + LL] | 4661.4034 | -46.8816 | 105.4295 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4618.891 | -58.9438 | 52.0146 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4661.4034 | 105.4295 | 52.0146 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.02 | 201] 1.5 [DL + LL] | 4913.6537 | 44.734 | 8.4621 |
| Bottom | 1.023 | 201] 1.5 [DL + LL] | 4956.1662 | -42.0096 | -234.3649 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4913.6537 | 8.4621 | -77.3532 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4956.1662 | -234.3649 | -77.3532 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.894 | 201] 1.5 [DL + LL] | 5215.1685 | 66.3982 | 895.651 |
| Bottom | 0.809 | 201] 1.5 [DL + LL] | 5275.3937 | -61.6301 | -36.212 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5215.1685 | 895.651 | -296.3012 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5275.3937 | -36.212 | -296.3012 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.841 | 201] 1.5 [DL + LL] | 5534.6051 | 52.7146 | -91.13 |
| Bottom | 0.853 | 201] 1.5 [DL + LL] | 5594.8303 | -53.8722 | 15.839 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5534.6051 | -91.13 | 33.8571 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5594.8303 | 15.839 | 33.8571 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.893 | 201] 1.5 [DL + LL] | 5862.7021 | 55.3441 | -35.3076 |
| Bottom | 0.902 | 201] 1.5 [DL + LL] | 5922.9273 | -54.4566 | 28.5526 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5862.7021 | -35.3076 | 20.0657 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5922.9273 | 28.5526 | 20.0657 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.943 | 201] 1.5 [DL + LL] | 6200.5987 | 54.3946 | -13.9169 |
| Bottom | 0.952 | 201] 1.5 [DL + LL] | 6260.8239 | -53.8418 | 21.3906 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6200.5987 | -13.9169 | 11.0116 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6260.8239 | 21.3906 | 11.0116 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.995 | 201] 1.5 [DL + LL] | 6549.0768 | 53.4752 | -10.6805 |
| Bottom | 1.003 | 201] 1.5 [DL + LL] | 6609.302 | -52.969 | 15.8118 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6549.0768 | -10.6805 | 8.2296 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6609.302 | 15.8118 | 8.2296 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.048 | 201] 1.5 [DL + LL] | 6908.9315 | 52.5237 | -5.5476 |
| Bottom | 1.056 | 201] 1.5 [DL + LL] | 6969.1567 | -51.9434 | 9.9182 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6908.9315 | -5.5476 | 4.7443 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6969.1567 | 9.9182 | 4.7443 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.103 | 201] 1.5 [DL + LL] | 7281.1798 | 51.8251 | -0.19 |
| Bottom | 1.111 | 201] 1.5 [DL + LL] | 7341.4051 | -51.6633 | 1.9649 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7281.1798 | -0.19 | 0.5314 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7341.4051 | 1.9649 | 0.5314 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.158 | 201] 1.5 [DL + LL] | 7667.0818 | 49.4763 | 3.7248 |
| Bottom | 1.166 | 201] 1.5 [DL + LL] | 7727.307 | -47.4948 | 2.7159 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7667.0818 | 3.7248 | -0.4643 | 336.3516 | 630.8175 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7727.307 | 2.7159 | -0.4643 | 336.3516 | 630.8175 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.22 | 201] 1.5 [DL + LL] | 8068.3796 | 55.3042 | 17.7983 |
| Bottom | 1.234 | 201] 1.5 [DL + LL] | 8130.5168 | -64.3869 | -7.2195 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8068.3796 | 17.7983 | -7.7891 | 321.1395 | 615.6054 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8130.5168 | -7.2195 | -7.7891 | 321.1395 | 615.6054 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.448 | 201] 1.5 [DL + LL] | 8539.9356 | 271.12 | 36.2491 |
| Bottom | 1.462 | 201] 1.5 [DL + LL] | 8620.2359 | -273.4809 | -44.1909 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8539.9356 | 36.2491 | -19.1767 | 237.3202 | 531.7862 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8620.2359 | -44.1909 | -19.1767 | 237.3202 | 531.7862 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.5 | 201] 1.5 [DL + LL] | 9087.1468 | 254.6515 | 59.833 |
| Bottom | 1.509 | 201] 1.5 [DL + LL] | 9164.0056 | -256.7216 | -34.6882 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9087.1468 | 59.833 | -23.4687 | 247.9308 | 542.3967 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9164.0056 | -34.6882 | -23.4687 | 247.9308 | 542.3967 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.545 | 201] 1.5 [DL + LL] | 1838.5505 | -71.0742 | 201.4546 |
| Bottom | 0.492 | 201] 1.5 [DL + LL] | 1881.0275 | 67.3761 | 33.5796 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1838.5505 | 201.4546 | -53.4614 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1881.0275 | 33.5796 | -53.4614 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.53 | 201] 1.5 [DL + LL] | 2058.1014 | -61.6545 | -112.221 |
| Bottom | 0.532 | 201] 1.5 [DL + LL] | 2100.5784 | 62.4885 | 80.2117 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2058.1014 | -112.221 | 60.9727 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2100.5784 | 80.2117 | 60.9727 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.562 | 201] 1.5 [DL + LL] | 2285.9495 | -63.2917 | -65.8094 |
| Bottom | 0.571 | 201] 1.5 [DL + LL] | 2328.4266 | 62.8909 | 72.5654 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2285.9495 | -65.8094 | 43.7928 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2328.4266 | 72.5654 | 43.7928 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.604 | 201] 1.5 [DL + LL] | 2519.9178 | -62.2615 | -69.0204 |
| Bottom | 0.612 | 201] 1.5 [DL + LL] | 2562.3948 | 62.092 | 70.5779 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2519.9178 | -69.0204 | 44.1826 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2562.3948 | 70.5779 | 44.1826 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 201] 1.5 [DL + LL] | 2760.7431 | -61.3891 | -66.9174 |
| Bottom | 0.625 | 201] 1.5 [DL + LL] | 2803.2202 | 61.1513 | 68.4084 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2760.7431 | -66.9174 | 42.8235 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2803.2202 | 68.4084 | 42.8235 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.662 | 201] 1.5 [DL + LL] | 3008.7668 | -60.3187 | -64.9255 |
| Bottom | 0.669 | 201] 1.5 [DL + LL] | 3051.2439 | 60.0325 | 66.1405 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3008.7668 | -64.9255 | 41.4691 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3051.2439 | 66.1405 | 41.4691 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.707 | 201] 1.5 [DL + LL] | 3264.5242 | -59.0877 | -62.8609 |
| Bottom | 0.715 | 201] 1.5 [DL + LL] | 3307.0012 | 58.7541 | 63.7591 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3264.5242 | -62.8609 | 40.0555 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3307.0012 | 63.7591 | 40.0555 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 201] 1.5 [DL + LL] | 3528.6071 | -57.6785 | -60.7252 |
| Bottom | 0.761 | 201] 1.5 [DL + LL] | 3571.0841 | 57.2954 | 61.2713 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3528.6071 | -60.7252 | 38.5851 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3571.0841 | 61.2713 | 38.5851 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.802 | 201] 1.5 [DL + LL] | 3801.7049 | -56.1367 | -58.4674 |
| Bottom | 0.809 | 201] 1.5 [DL + LL] | 3844.1819 | 55.7098 | 58.8105 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3801.7049 | -58.4674 | 37.0839 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3844.1819 | 58.8105 | 37.0839 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.855 | 201] 1.5 [DL + LL] | 4084.6053 | -54.4227 | -55.8939 |
| Bottom | 0.863 | 201] 1.5 [DL + LL] | 4127.0823 | 54.0222 | 51.1772 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4084.6053 | -55.8939 | 33.8315 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4127.0823 | 51.1772 | 33.8315 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 201] 1.5 [DL + LL] | 4377.9607 | -52.1462 | -58.9763 |
| Bottom | 0.921 | 201] 1.5 [DL + LL] | 4420.4377 | 52.0074 | 101.9225 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4377.9607 | -58.9763 | 50.9634 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4420.4377 | 101.9225 | 50.9634 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.977 | 201] 1.5 [DL + LL] | 4683.9954 | -49.2751 | 5.1653 |
| Bottom | 0.985 | 201] 1.5 [DL + LL] | 4726.4724 | 46.8903 | -227.4987 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4683.9954 | 5.1653 | -74.0874 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4726.4724 | -227.4987 | -74.0874 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.86 | 201] 1.5 [DL + LL] | 4994.37 | -72.9601 | 854.4423 |
| Bottom | 0.779 | 201] 1.5 [DL + LL] | 5054.6314 | 68.0771 | -30.9702 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4994.37 | 854.4423 | -281.5234 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5054.6314 | -30.9702 | -281.5234 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.812 | 201] 1.5 [DL + LL] | 5323.0001 | -58.3342 | -84.3366 |
| Bottom | 0.825 | 201] 1.5 [DL + LL] | 5383.2615 | 59.6262 | 16.4441 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5323.0001 | -84.3366 | 31.9053 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5383.2615 | 16.4441 | 31.9053 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.865 | 201] 1.5 [DL + LL] | 5659.4127 | -60.5608 | -32.5667 |
| Bottom | 0.874 | 201] 1.5 [DL + LL] | 5719.6741 | 59.7712 | 27.6282 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5659.4127 | -32.5667 | 18.9314 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5719.6741 | 27.6282 | 18.9314 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.917 | 201] 1.5 [DL + LL] | 6004.7363 | -59.074 | -12.615 |
| Bottom | 0.925 | 201] 1.5 [DL + LL] | 6064.9977 | 58.6434 | 20.2236 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6004.7363 | -12.615 | 10.2602 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6064.9977 | 20.2236 | 10.2602 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.969 | 201] 1.5 [DL + LL] | 6359.8298 | -57.6208 | -9.5998 |
| Bottom | 0.977 | 201] 1.5 [DL + LL] | 6420.0912 | 57.2444 | 14.3316 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6359.8298 | -9.5998 | 7.4495 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6420.0912 | 14.3316 | 7.4495 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.022 | 201] 1.5 [DL + LL] | 6725.5551 | -56.1208 | -4.7569 |
| Bottom | 1.031 | 201] 1.5 [DL + LL] | 6785.8165 | 55.6866 | 8.0795 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6725.5551 | -4.7569 | 3.941 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6785.8165 | 8.0795 | 3.941 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.078 | 201] 1.5 [DL + LL] | 7102.9822 | -54.8309 | 0.2464 |
| Bottom | 1.086 | 201] 1.5 [DL + LL] | 7163.2436 | 54.8072 | -0.5793 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7102.9822 | 0.2464 | -0.3878 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7163.2436 | -0.5793 | -0.3878 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.134 | 201] 1.5 [DL + LL] | 7493.404 | -51.9179 | 3.4502 |
| Bottom | 1.142 | 201] 1.5 [DL + LL] | 7553.6654 | 50.2937 | 1.4569 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7493.404 | 3.4502 | -0.7579 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7553.6654 | 1.4569 | -0.7579 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.195 | 201] 1.5 [DL + LL] | 7897.1059 | -55.4628 | 17.8752 |
| Bottom | 1.207 | 201] 1.5 [DL + LL] | 7959.2803 | 63.0601 | -21.6649 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7897.1059 | 17.8752 | -12.2602 | 321.6105 | 616.2533 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7959.2803 | -21.6649 | -12.2602 | 321.6105 | 616.2533 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.369 | 201] 1.5 [DL + LL] | 8360.7609 | -227.0589 | 42.2852 |
| Bottom | 1.379 | 201] 1.5 [DL + LL] | 8441.1094 | 229.4211 | -24.3266 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8360.7609 | 42.2852 | -15.8753 | 237.6009 | 532.2437 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8441.1094 | -24.3266 | -15.8753 | 237.6009 | 532.2437 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.449 | 201] 1.5 [DL + LL] | 8943.0536 | -231.9517 | 34.5247 |
| Bottom | 1.46 | 201] 1.5 [DL + LL] | 9019.9587 | 234.0231 | -27.1527 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8943.0536 | 34.5247 | -15.2847 | 248.2332 | 542.876 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9019.9587 | -27.1527 | -15.2847 | 248.2332 | 542.876 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.496 | 201] 1.5 [DL + LL] | 1403.9688 | 78.3457 | 171.8119 |
| Bottom | 0.415 | 201] 1.5 [DL + LL] | 1446.4458 | -68.0666 | 19.9222 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1403.9688 | 171.8119 | -48.3919 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1446.4458 | 19.9222 | -48.3919 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.442 | 201] 1.5 [DL + LL] | 1669.3434 | 63.0749 | -23.1405 |
| Bottom | 0.45 | 201] 1.5 [DL + LL] | 1711.8204 | -64.0379 | 19.0028 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1669.3434 | -23.1405 | 13.3008 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1711.8204 | 19.0028 | 13.3008 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.49 | 201] 1.5 [DL + LL] | 1934.202 | 64.098 | -25.1808 |
| Bottom | 0.496 | 201] 1.5 [DL + LL] | 1976.679 | -63.4672 | 23.7929 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1934.202 | -25.1808 | 15.4456 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1976.679 | 23.7929 | 15.4456 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.537 | 201] 1.5 [DL + LL] | 2197.9557 | 63 | -20.4561 |
| Bottom | 0.544 | 201] 1.5 [DL + LL] | 2240.4327 | -62.4957 | 22.8146 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2197.9557 | -20.4561 | 13.6282 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2240.4327 | 22.8146 | 13.6282 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.586 | 201] 1.5 [DL + LL] | 2460.661 | 62.405 | -21.2261 |
| Bottom | 0.594 | 201] 1.5 [DL + LL] | 2503.138 | -61.8018 | 22.6766 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2460.661 | -21.2261 | 13.8243 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2503.138 | 22.6766 | 13.8243 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.635 | 201] 1.5 [DL + LL] | 2722.3547 | 61.6879 | -21.1991 |
| Bottom | 0.643 | 201] 1.5 [DL + LL] | 2764.8317 | -61.0764 | 22.5309 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2722.3547 | -21.1991 | 13.7654 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2764.8317 | 22.5309 | 13.7654 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.648 | 201] 1.5 [DL + LL] | 2983.0064 | 61.0078 | -21.1561 |
| Bottom | 0.655 | 201] 1.5 [DL + LL] | 3025.4834 | -60.3577 | 22.2722 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2983.0064 | -21.1561 | 13.6667 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3025.4834 | 22.2722 | 13.6667 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.694 | 201] 1.5 [DL + LL] | 3242.5762 | 60.318 | -21.2094 |
| Bottom | 0.701 | 201] 1.5 [DL + LL] | 3285.0532 | -59.6291 | 21.722 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3242.5762 | -21.2094 | 13.5058 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3285.0532 | 21.722 | 13.5058 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.761 | 201] 1.5 [DL + LL] | 3501.0114 | 59.5808 | -21.573 |
| Bottom | 0.769 | 201] 1.5 [DL + LL] | 3543.4885 | -58.8946 | 19.811 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3501.0114 | -21.573 | 13.0062 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3543.4885 | 19.811 | 13.0062 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.813 | 201] 1.5 [DL + LL] | 3758.26 | 58.6714 | -23.4753 |
| Bottom | 0.82 | 201] 1.5 [DL + LL] | 3800.737 | -57.6025 | 28.6346 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3758.26 | -23.4753 | 16.4025 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3800.737 | 28.6346 | 16.4025 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 201] 1.5 [DL + LL] | 4014.2322 | 58.7499 | -14.0224 |
| Bottom | 0.851 | 201] 1.5 [DL + LL] | 4056.7092 | -57.5946 | 59.5364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4014.2322 | -14.0224 | 23.3362 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4056.7092 | 59.5364 | 23.3362 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.896 | 201] 1.5 [DL + LL] | 4266.5502 | 57.327 | 22.8097 |
| Bottom | 0.919 | 201] 1.5 [DL + LL] | 4309.0272 | -57.5015 | -260.0244 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4266.5502 | 22.8097 | -89.9806 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4309.0272 | -260.0244 | -89.9806 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.812 | 201] 1.5 [DL + LL] | 4539.513 | 95.3391 | 754.0082 |
| Bottom | 0.732 | 201] 1.5 [DL + LL] | 4599.7744 | -86.4741 | 66.1192 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4539.513 | 754.0082 | -218.9655 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4599.7744 | 66.1192 | -218.9655 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.755 | 201] 1.5 [DL + LL] | 4818.9912 | 87.5795 | 26.749 |
| Bottom | 0.763 | 201] 1.5 [DL + LL] | 4879.2526 | -86.5404 | -21.2913 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4818.9912 | 26.749 | -15.2179 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4879.2526 | -21.2913 | -15.2179 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.797 | 201] 1.5 [DL + LL] | 5098.893 | 85.2057 | -62.7635 |
| Bottom | 0.803 | 201] 1.5 [DL + LL] | 5159.1544 | -84.2944 | 19.149 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5098.893 | -62.7635 | 25.9048 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5159.1544 | 19.149 | 25.9048 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.835 | 201] 1.5 [DL + LL] | 5378.1751 | 83.3881 | -25.7722 |
| Bottom | 0.843 | 201] 1.5 [DL + LL] | 5438.4364 | -82.0617 | 28.3166 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5378.1751 | -25.7722 | 17.0311 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5438.4364 | 28.3166 | 17.0311 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.875 | 201] 1.5 [DL + LL] | 5656.1209 | 81.7787 | -17.918 |
| Bottom | 0.883 | 201] 1.5 [DL + LL] | 5716.3823 | -80.1861 | 26.3196 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5656.1209 | -17.918 | 13.9258 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5716.3823 | 26.3196 | 13.9258 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.915 | 201] 1.5 [DL + LL] | 5932.6493 | 79.6776 | -21.2358 |
| Bottom | 0.923 | 201] 1.5 [DL + LL] | 5992.9107 | -77.9225 | 24.937 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5932.6493 | -21.2358 | 14.5582 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5992.9107 | 24.937 | 14.5582 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.955 | 201] 1.5 [DL + LL] | 6207.7273 | 77.5557 | -24.4183 |
| Bottom | 0.963 | 201] 1.5 [DL + LL] | 6267.9886 | -75.9069 | 26.9193 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6207.7273 | -24.4183 | 16.2059 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6267.9886 | 26.9193 | 16.2059 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.994 | 201] 1.5 [DL + LL] | 6481.2963 | 74.4942 | -24.5487 |
| Bottom | 1.001 | 201] 1.5 [DL + LL] | 6541.5577 | -70.6019 | 19.7724 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6481.2963 | -24.5487 | 13.9833 | 336.8617 | 631.5044 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6541.5577 | 19.7724 | 13.9833 | 336.8617 | 631.5044 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.035 | 201] 1.5 [DL + LL] | 6753.5111 | 76.6033 | -34.1774 |
| Bottom | 1.047 | 201] 1.5 [DL + LL] | 6815.6856 | -86.6389 | -78.3604 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6753.5111 | -34.1774 | -13.8353 | 321.6105 | 616.2533 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6815.6856 | -78.3604 | -13.8353 | 321.6105 | 616.2533 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.298 | 201] 1.5 [DL + LL] | 7240.2519 | 243.4129 | 179.8224 |
| Bottom | 1.306 | 201] 1.5 [DL + LL] | 7320.6004 | -245.7752 | -146.8352 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7240.2519 | 179.8224 | -77.8908 | 237.6009 | 532.2437 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7320.6004 | -146.8352 | -77.8908 | 237.6009 | 532.2437 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.335 | 201] 1.5 [DL + LL] | 7741.2082 | 229.4624 | 122.2969 |
| Bottom | 1.341 | 201] 1.5 [DL + LL] | 7818.1132 | -231.5338 | -54.0171 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7741.2082 | 122.2969 | -43.8715 | 248.2332 | 542.876 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7818.1132 | -54.0171 | -43.8715 | 248.2332 | 542.876 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.024 | 201] 1.5 [DL + LL] | 2272.5709 | 161.0752 | -916.3711 |
| Bottom | 0.678 | 201] 1.5 [DL + LL] | 2329.2542 | -149.1049 | 268.4377 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2272.5709 | -916.3711 | 376.0224 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2329.2542 | 268.4377 | 376.0224 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.617 | 201] 1.5 [DL + LL] | 2494.1975 | 134.8947 | -143.3352 |
| Bottom | 0.64 | 201] 1.5 [DL + LL] | 2550.8807 | -135.0451 | 208.6076 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2494.1975 | -143.3352 | 111.5031 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2550.8807 | 208.6076 | 111.5031 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 201] 1.5 [DL + LL] | 2719.9288 | 133.8029 | -187.135 |
| Bottom | 0.622 | 201] 1.5 [DL + LL] | 2776.6121 | -131.7983 | 199.2989 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2719.9288 | -187.135 | 122.4867 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2776.6121 | 199.2989 | 122.4867 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.629 | 201] 1.5 [DL + LL] | 2949.5289 | 128.3149 | -189.2417 |
| Bottom | 0.634 | 201] 1.5 [DL + LL] | 3006.2121 | -126.5602 | 195.3015 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2949.5289 | -189.2417 | 121.8892 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3006.2121 | 195.3015 | 121.8892 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.663 | 201] 1.5 [DL + LL] | 3183.6808 | 122.953 | -186.0309 |
| Bottom | 0.667 | 201] 1.5 [DL + LL] | 3240.3641 | -121.0519 | 191.0548 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3183.6808 | -186.0309 | 119.5223 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3240.3641 | 191.0548 | 119.5223 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.683 | 201] 1.5 [DL + LL] | 3423.0503 | 117.1481 | -182.6976 |
| Bottom | 0.688 | 201] 1.5 [DL + LL] | 3479.7336 | -115.1106 | 186.7022 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3423.0503 | -182.6976 | 117.0827 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3479.7336 | 186.7022 | 117.0827 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.689 | 201] 1.5 [DL + LL] | 3668.295 | 110.9204 | -179.0303 |
| Bottom | 0.694 | 201] 1.5 [DL + LL] | 3724.9783 | -108.7293 | 182.2361 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3668.295 | -179.0303 | 114.5008 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3724.9783 | 182.2361 | 114.5008 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 201] 1.5 [DL + LL] | 3920.0987 | 104.2117 | -174.9658 |
| Bottom | 0.714 | 201] 1.5 [DL + LL] | 3976.782 | -101.8502 | 177.6401 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3920.0987 | -174.9658 | 111.7516 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3976.782 | 177.6401 | 111.7516 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.735 | 201] 1.5 [DL + LL] | 4179.1763 | 97.007 | -170.4348 |
| Bottom | 0.741 | 201] 1.5 [DL + LL] | 4235.8596 | -94.4485 | 173.1291 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4179.1763 | -170.4348 | 108.8821 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4235.8596 | 173.1291 | 108.8821 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.765 | 201] 1.5 [DL + LL] | 4446.2768 | 89.2722 | -165.0875 |
| Bottom | 0.77 | 201] 1.5 [DL + LL] | 4502.9601 | -86.5682 | 168.1359 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4446.2768 | -165.0875 | 105.6031 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4502.9601 | 168.1359 | 105.6031 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.795 | 201] 1.5 [DL + LL] | 4722.398 | 80.65 | -159.2968 |
| Bottom | 0.796 | 201] 1.5 [DL + LL] | 4779.0812 | -77.866 | 122.4957 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4722.398 | -159.2968 | 89.2497 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4779.0812 | 122.4957 | 89.2497 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.828 | 201] 1.5 [DL + LL] | 5006.964 | 70.4491 | -198.7298 |
| Bottom | 0.842 | 201] 1.5 [DL + LL] | 5063.6473 | -65.8079 | 451.587 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5006.964 | -198.7298 | 206.309 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5063.6473 | 451.587 | 206.309 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.758 | 201] 1.5 [DL + LL] | 5332.066 | 78.6503 | -1409.1727 |
| Bottom | 0.667 | 201] 1.5 [DL + LL] | 5410.0055 | -73.652 | 231.3949 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5332.066 | -1409.1727 | 520.8718 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5410.0055 | 231.3949 | 520.8718 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.685 | 201] 1.5 [DL + LL] | 5648.9642 | 65.6091 | -202.5967 |
| Bottom | 0.695 | 201] 1.5 [DL + LL] | 5726.9037 | -64.9856 | 237.4373 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5648.9642 | -202.5967 | 139.4691 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5726.9037 | 237.4373 | 139.4691 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.717 | 201] 1.5 [DL + LL] | 5968.5094 | 62.6934 | -174.0423 |
| Bottom | 0.725 | 201] 1.5 [DL + LL] | 6046.4489 | -60.7164 | 205.133 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5968.5094 | -174.0423 | 120.2124 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6046.4489 | 205.133 | 120.2124 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.752 | 201] 1.5 [DL + LL] | 6290.8773 | 57.1598 | -185.727 |
| Bottom | 0.761 | 201] 1.5 [DL + LL] | 6368.8168 | -55.194 | 193.4437 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6290.8773 | -185.727 | 120.2326 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6368.8168 | 193.4437 | 120.2326 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.788 | 201] 1.5 [DL + LL] | 6616.6457 | 51.1285 | -176.8016 |
| Bottom | 0.797 | 201] 1.5 [DL + LL] | 6694.5852 | -48.9978 | 183.4472 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6616.6457 | -176.8016 | 114.239 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6694.5852 | 183.4472 | 114.239 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.825 | 201] 1.5 [DL + LL] | 6946.6373 | 44.5606 | -164.6509 |
| Bottom | 0.833 | 201] 1.5 [DL + LL] | 7024.5767 | -42.2499 | 172.178 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6946.6373 | -164.6509 | 106.8215 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7024.5767 | 172.178 | 106.8215 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.862 | 201] 1.5 [DL + LL] | 7281.6675 | 37.3774 | -152.0338 |
| Bottom | 0.87 | 201] 1.5 [DL + LL] | 7359.607 | -34.8388 | 159.0693 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7281.6675 | -152.0338 | 98.6756 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7359.607 | 159.0693 | 98.6756 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.899 | 201] 1.5 [DL + LL] | 7622.3488 | 29.625 | -139.2882 |
| Bottom | 0.907 | 201] 1.5 [DL + LL] | 7700.2883 | -27.3466 | 146.0545 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7622.3488 | -139.2882 | 90.5203 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7700.2883 | 146.0545 | 90.5203 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.936 | 201] 1.5 [DL + LL] | 7970.1018 | 19.915 | -125.8401 |
| Bottom | 0.944 | 201] 1.5 [DL + LL] | 8050.5156 | -15.8958 | 133.5382 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7970.1018 | -125.8401 | 79.7679 | 675.4828 | 1056.561 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8050.5156 | 133.5382 | 79.7679 | 675.4828 | 1056.561 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.11 | 201] 1.5 [DL + LL] | 8318.3812 | 248.1068 | -97.476 |
| Bottom | 1.129 | 201] 1.5 [DL + LL] | 8422.3006 | -251.162 | 176.8649 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8318.3812 | -97.476 | 65.3678 | 416.4444 | 797.5227 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8422.3006 | 176.8649 | 65.3678 | 416.4444 | 797.5227 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.147 | 201] 1.5 [DL + LL] | 8755.1582 | 238.1575 | -128.2895 |
| Bottom | 1.15 | 201] 1.5 [DL + LL] | 8854.6239 | -240.8365 | 8.3323 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8755.1582 | -128.2895 | 34.0765 | 444.7603 | 825.8386 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8854.6239 | 8.3323 | 34.0765 | 444.7603 | 825.8386 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 201] 1.5 [DL + LL] | 1970.6806 | -148.753 | -817.4008 |
| Bottom | 0.62 | 201] 1.5 [DL + LL] | 2027.3639 | 137.6921 | 244.3229 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1970.6806 | -817.4008 | 336.9914 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2027.3639 | 244.3229 | 336.9914 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.562 | 201] 1.5 [DL + LL] | 2201.1736 | -123.9478 | -146.7895 |
| Bottom | 0.583 | 201] 1.5 [DL + LL] | 2257.8569 | 124.8209 | 198.2153 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2201.1736 | -146.7895 | 109.362 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2257.8569 | 198.2153 | 109.362 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.566 | 201] 1.5 [DL + LL] | 2435.8067 | -124.2974 | -179.2143 |
| Bottom | 0.571 | 201] 1.5 [DL + LL] | 2492.49 | 122.8364 | 189.538 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2435.8067 | -179.2143 | 116.9236 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2492.49 | 189.538 | 116.9236 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.58 | 201] 1.5 [DL + LL] | 2674.388 | -119.8637 | -180.8243 |
| Bottom | 0.584 | 201] 1.5 [DL + LL] | 2731.0713 | 118.6916 | 185.6994 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2674.388 | -180.8243 | 116.2166 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2731.0713 | 185.6994 | 116.2166 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.613 | 201] 1.5 [DL + LL] | 2917.2198 | -115.5918 | -177.2922 |
| Bottom | 0.619 | 201] 1.5 [DL + LL] | 2973.9031 | 114.258 | 181.4665 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2917.2198 | -177.2922 | 113.7508 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2973.9031 | 181.4665 | 113.7508 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.637 | 201] 1.5 [DL + LL] | 3164.7011 | -110.8153 | -173.6615 |
| Bottom | 0.642 | 201] 1.5 [DL + LL] | 3221.3844 | 109.3443 | 176.9578 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3164.7011 | -173.6615 | 111.1665 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3221.3844 | 176.9578 | 111.1665 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.647 | 201] 1.5 [DL + LL] | 3417.2507 | -105.5696 | -169.7586 |
| Bottom | 0.652 | 201] 1.5 [DL + LL] | 3473.934 | 103.9492 | 172.1929 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3417.2507 | -169.7586 | 108.4142 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3473.934 | 172.1929 | 108.4142 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.669 | 201] 1.5 [DL + LL] | 3675.3261 | -99.7996 | -165.5105 |
| Bottom | 0.674 | 201] 1.5 [DL + LL] | 3732.0094 | 98.0193 | 167.1614 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3675.3261 | -165.5105 | 105.4674 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3732.0094 | 167.1614 | 105.4674 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.696 | 201] 1.5 [DL + LL] | 3939.4223 | -93.4912 | -160.8593 |
| Bottom | 0.702 | 201] 1.5 [DL + LL] | 3996.1056 | 91.527 | 162.216 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3939.4223 | -160.8593 | 102.4199 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3996.1056 | 162.216 | 102.4199 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.727 | 201] 1.5 [DL + LL] | 4210.0742 | -86.622 | -155.3311 |
| Bottom | 0.732 | 201] 1.5 [DL + LL] | 4266.7575 | 84.5392 | 156.5928 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4210.0742 | -155.3311 | 98.8802 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4266.7575 | 156.5928 | 98.8802 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.758 | 201] 1.5 [DL + LL] | 4487.9989 | -78.8558 | -149.4618 |
| Bottom | 0.759 | 201] 1.5 [DL + LL] | 4544.6821 | 76.743 | 110.4678 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4487.9989 | -149.4618 | 82.3443 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4544.6821 | 110.4678 | 82.3443 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.792 | 201] 1.5 [DL + LL] | 4772.245 | -69.5228 | -187.996 |
| Bottom | 0.807 | 201] 1.5 [DL + LL] | 4828.9283 | 65.593 | 425.6371 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4772.245 | -187.996 | 194.679 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4828.9283 | 425.6371 | 194.679 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.725 | 201] 1.5 [DL + LL] | 5096.3381 | -78.2749 | -1343.5159 |
| Bottom | 0.641 | 201] 1.5 [DL + LL] | 5174.2776 | 73.9534 | 218.8426 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5096.3381 | -1343.5159 | 496.0294 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5174.2776 | 218.8426 | 496.0294 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.658 | 201] 1.5 [DL + LL] | 5412.1838 | -65.7987 | -185.113 |
| Bottom | 0.669 | 201] 1.5 [DL + LL] | 5490.1233 | 65.5175 | 225.0515 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5412.1838 | -185.113 | 130.0014 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5490.1233 | 225.0515 | 130.0014 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.69 | 201] 1.5 [DL + LL] | 5730.2127 | -63.0414 | -157.2068 |
| Bottom | 0.698 | 201] 1.5 [DL + LL] | 5808.1522 | 61.3796 | 191.5135 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5730.2127 | -157.2068 | 110.5615 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5808.1522 | 191.5135 | 110.5615 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.725 | 201] 1.5 [DL + LL] | 6050.6575 | -57.5104 | -171.1281 |
| Bottom | 0.733 | 201] 1.5 [DL + LL] | 6128.597 | 55.9214 | 179.9333 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6050.6575 | -171.1281 | 111.327 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6128.597 | 179.9333 | 111.327 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.761 | 201] 1.5 [DL + LL] | 6373.8373 | -51.5819 | -162.9175 |
| Bottom | 0.769 | 201] 1.5 [DL + LL] | 6451.7768 | 49.8371 | 170.1373 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6373.8373 | -162.9175 | 105.6237 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6451.7768 | 170.1373 | 105.6237 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.797 | 201] 1.5 [DL + LL] | 6700.4041 | -45.1176 | -151.317 |
| Bottom | 0.805 | 201] 1.5 [DL + LL] | 6778.3436 | 43.2056 | 158.9036 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6700.4041 | -151.317 | 98.3909 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6778.3436 | 158.9036 | 98.3909 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.833 | 201] 1.5 [DL + LL] | 7031.0197 | -38.0541 | -139.3805 |
| Bottom | 0.841 | 201] 1.5 [DL + LL] | 7108.9591 | 35.9515 | 145.3538 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7031.0197 | -139.3805 | 90.3184 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7108.9591 | 145.3538 | 90.3184 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.869 | 201] 1.5 [DL + LL] | 7366.1386 | -30.3691 | -127.7966 |
| Bottom | 0.878 | 201] 1.5 [DL + LL] | 7444.0781 | 28.583 | 131.2546 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7366.1386 | -127.7966 | 82.1817 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7444.0781 | 131.2546 | 82.1817 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.906 | 201] 1.5 [DL + LL] | 7707.1023 | -20.8375 | -116.3873 |
| Bottom | 0.914 | 201] 1.5 [DL + LL] | 7787.516 | 17.4391 | 115.3742 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7707.1023 | -116.3873 | 71.2649 | 675.4828 | 1056.561 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7787.516 | 115.3742 | 71.2649 | 675.4828 | 1056.561 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.067 | 201] 1.5 [DL + LL] | 8048.458 | -232.9177 | -92.6438 |
| Bottom | 1.089 | 201] 1.5 [DL + LL] | 8152.3773 | 235.973 | 215.6883 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8048.458 | -92.6438 | 73.4643 | 416.4444 | 797.5227 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8152.3773 | 215.6883 | 73.4643 | 416.4444 | 797.5227 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.118 | 201] 1.5 [DL + LL] | 8538.2241 | -227.6894 | -171.3518 |
| Bottom | 1.118 | 201] 1.5 [DL + LL] | 8637.6897 | 230.3684 | 19.0748 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8538.2241 | -171.3518 | 47.4729 | 444.7603 | 825.8386 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8637.6897 | 19.0748 | 47.4729 | 444.7603 | 825.8386 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.444 | 201] 1.5 [DL + LL] | 2158.3223 | -207.8488 | 237.331 |
| Bottom | 0.367 | 201] 1.5 [DL + LL] | 2234.1361 | 177.2319 | 10.3367 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2158.3223 | 237.331 | -72.023 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2234.1361 | 10.3367 | -72.023 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.365 | 201] 1.5 [DL + LL] | 2535.5749 | -147.8704 | 55.4914 |
| Bottom | 0.376 | 201] 1.5 [DL + LL] | 2611.3888 | 154.4204 | -32.9636 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2535.5749 | 55.4914 | -27.9218 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2611.3888 | -32.9636 | -27.9218 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.401 | 201] 1.5 [DL + LL] | 2909.7925 | -156.4009 | 11.6672 |
| Bottom | 0.407 | 201] 1.5 [DL + LL] | 2985.6064 | 153.8068 | -26.6398 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2909.7925 | 11.6672 | -11.9897 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2985.6064 | -26.6398 | -11.9897 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.428 | 201] 1.5 [DL + LL] | 3280.3575 | -149.4218 | 15.6543 |
| Bottom | 0.435 | 201] 1.5 [DL + LL] | 3356.1713 | 148.4603 | -22.4959 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3280.3575 | 15.6543 | -11.9363 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3356.1713 | -22.4959 | -11.9363 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.462 | 201] 1.5 [DL + LL] | 3647.4906 | -145.7772 | 18.4033 |
| Bottom | 0.469 | 201] 1.5 [DL + LL] | 3723.3045 | 144.2515 | -22.004 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3647.4906 | 18.4033 | -12.6426 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3723.3045 | -22.004 | -12.6426 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.495 | 201] 1.5 [DL + LL] | 4011.3408 | -141.4421 | 18.0176 |
| Bottom | 0.501 | 201] 1.5 [DL + LL] | 4087.1547 | 139.8396 | -21.9658 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4011.3408 | 18.0176 | -12.4982 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4087.1547 | -21.9658 | -12.4982 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.519 | 201] 1.5 [DL + LL] | 4371.9163 | -137.1777 | 17.5341 |
| Bottom | 0.526 | 201] 1.5 [DL + LL] | 4447.7302 | 135.4098 | -21.872 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4371.9163 | 17.5341 | -12.3077 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4447.7302 | -21.872 | -12.3077 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.551 | 201] 1.5 [DL + LL] | 4729.1886 | -132.7839 | 17.4174 |
| Bottom | 0.558 | 201] 1.5 [DL + LL] | 4805.0024 | 130.9079 | -21.8457 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4729.1886 | 17.4174 | -12.2574 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4805.0024 | -21.8457 | -12.2574 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.582 | 201] 1.5 [DL + LL] | 5083.0822 | -128.1561 | 17.5209 |
| Bottom | 0.589 | 201] 1.5 [DL + LL] | 5158.896 | 126.0483 | -24.4556 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5083.0822 | 17.5209 | -13.1174 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5158.896 | -24.4556 | -13.1174 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 201] 1.5 [DL + LL] | 5433.4572 | -123.5648 | 15.1368 |
| Bottom | 0.623 | 201] 1.5 [DL + LL] | 5509.2711 | 121.3049 | -38.9857 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5433.4572 | 15.1368 | -16.994 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5509.2711 | -38.9857 | -16.994 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.653 | 201] 1.5 [DL + LL] | 5780.0458 | -118.4289 | 0.4101 |
| Bottom | 0.659 | 201] 1.5 [DL + LL] | 5855.8596 | 116.2755 | -38.1877 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5780.0458 | 0.4101 | -12.1516 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5855.8596 | -38.1877 | -12.1516 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.687 | 201] 1.5 [DL + LL] | 6120.8596 | -110.8923 | -0.1106 |
| Bottom | 0.701 | 201] 1.5 [DL + LL] | 6196.6734 | 107.1874 | 343.5758 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6120.8596 | -0.1106 | 109.4217 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6196.6734 | 343.5758 | 109.4217 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.633 | 201] 1.5 [DL + LL] | 6473.2476 | -129.0827 | -853.1416 |
| Bottom | 0.61 | 201] 1.5 [DL + LL] | 6567.7197 | 121.0891 | -64.5498 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6473.2476 | -853.1416 | 250.8575 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6567.7197 | -64.5498 | 250.8575 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.632 | 201] 1.5 [DL + LL] | 6828.195 | -112.7536 | -67.9096 |
| Bottom | 0.641 | 201] 1.5 [DL + LL] | 6922.6671 | 112.7735 | 32.5722 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6828.195 | -67.9096 | 31.9473 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6922.6671 | 32.5722 | 31.9473 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.664 | 201] 1.5 [DL + LL] | 7183.2411 | -113.722 | 33.2196 |
| Bottom | 0.673 | 201] 1.5 [DL + LL] | 7277.7132 | 111.137 | 5.2623 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7183.2411 | 33.2196 | -8.762 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7277.7132 | 5.2623 | -8.762 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.695 | 201] 1.5 [DL + LL] | 7538.1039 | -108.2948 | 11.4762 |
| Bottom | 0.703 | 201] 1.5 [DL + LL] | 7632.576 | 106.3533 | -8.7539 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7538.1039 | 11.4762 | -6.2708 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7632.576 | -8.7539 | -6.2708 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.726 | 201] 1.5 [DL + LL] | 7892.0734 | -104.3917 | 2.4155 |
| Bottom | 0.734 | 201] 1.5 [DL + LL] | 7986.5455 | 101.9935 | -13.5163 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7892.0734 | 2.4155 | -4.912 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7986.5455 | -13.5163 | -4.912 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.757 | 201] 1.5 [DL + LL] | 8244.9237 | -99.7284 | 2.5742 |
| Bottom | 0.764 | 201] 1.5 [DL + LL] | 8339.3958 | 97.14 | -18.0358 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8244.9237 | 2.5742 | -6.4179 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8339.3958 | -18.0358 | -6.4179 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.787 | 201] 1.5 [DL + LL] | 8596.4368 | -94.8956 | 3.1951 |
| Bottom | 0.795 | 201] 1.5 [DL + LL] | 8690.9089 | 92.2133 | -18.9472 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8596.4368 | 3.1951 | -6.9344 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8690.9089 | -18.9472 | -6.9344 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.817 | 201] 1.5 [DL + LL] | 8946.4374 | -89.3771 | 7.7309 |
| Bottom | 0.825 | 201] 1.5 [DL + LL] | 9040.9095 | 85.6744 | 4.5725 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8946.4374 | 7.7309 | -0.9221 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9040.9095 | 4.5725 | -0.9221 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 201] 1.5 [DL + LL] | 9294.9581 | -85.2649 | 37.7339 |
| Bottom | 0.857 | 201] 1.5 [DL + LL] | 9392.4293 | 92.8376 | 63.8471 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9294.9581 | 37.7339 | 8.2492 | 662.5252 | 1124.4382 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9392.4293 | 63.8471 | 8.2492 | 662.5252 | 1124.4382 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.872 | 201] 1.5 [DL + LL] | 9769.9823 | -74.8 | -157.5379 |
| Bottom | 0.884 | 201] 1.5 [DL + LL] | 9895.9451 | 72.2634 | 97.6593 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9769.9823 | -157.5379 | 60.8698 | 444.5515 | 906.4646 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9895.9451 | 97.6593 | 60.8698 | 444.5515 | 906.4646 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 201] 1.5 [DL + LL] | 10255.7319 | -46.8882 | -94.8083 |
| Bottom | 0.918 | 201] 1.5 [DL + LL] | 10376.2963 | 24.7909 | 41.6434 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10255.7319 | -94.8083 | 33.9491 | 470.1086 | 932.0217 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10376.2963 | 41.6434 | 33.9491 | 470.1086 | 932.0217 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.405 | 201] 1.5 [DL + LL] | 2049.7263 | -188.6167 | -212.5903 |
| Bottom | 0.34 | 201] 1.5 [DL + LL] | 2125.5402 | 159.6691 | -22.3349 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2049.7263 | -212.5903 | 60.5994 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2125.5402 | -22.3349 | 60.5994 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.343 | 201] 1.5 [DL + LL] | 2415.8551 | -135.3125 | -50.2357 |
| Bottom | 0.352 | 201] 1.5 [DL + LL] | 2491.6689 | 141.0674 | 20.9397 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2415.8551 | -50.2357 | 22.7245 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2491.6689 | 20.9397 | 22.7245 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.378 | 201] 1.5 [DL + LL] | 2779.9948 | -143.6839 | -7.7909 |
| Bottom | 0.383 | 201] 1.5 [DL + LL] | 2855.8086 | 141.477 | 15.6117 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2779.9948 | -7.7909 | 7.5785 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2855.8086 | 15.6117 | 7.5785 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.407 | 201] 1.5 [DL + LL] | 3142.0104 | -138.4036 | -12.5011 |
| Bottom | 0.413 | 201] 1.5 [DL + LL] | 3217.8243 | 137.6265 | 11.8268 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3142.0104 | -12.5011 | 7.8972 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3217.8243 | 11.8268 | 7.8972 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.44 | 201] 1.5 [DL + LL] | 3501.8192 | -135.8708 | -16.3082 |
| Bottom | 0.447 | 201] 1.5 [DL + LL] | 3577.6331 | 134.5983 | 11.6205 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3501.8192 | -16.3082 | 9.0548 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3577.6331 | 11.6205 | 9.0548 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.473 | 201] 1.5 [DL + LL] | 3859.4231 | -132.626 | -16.9197 |
| Bottom | 0.479 | 201] 1.5 [DL + LL] | 3935.2369 | 131.2566 | 11.8028 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3859.4231 | -16.9197 | 9.3172 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3935.2369 | 11.8028 | 9.3172 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.499 | 201] 1.5 [DL + LL] | 4214.6836 | -129.355 | -17.3602 |
| Bottom | 0.504 | 201] 1.5 [DL + LL] | 4290.4974 | 127.7894 | 11.8591 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4214.6836 | -17.3602 | 9.4831 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4290.4974 | 11.8591 | 9.4831 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.531 | 201] 1.5 [DL + LL] | 4567.4391 | -125.8983 | -18.1137 |
| Bottom | 0.536 | 201] 1.5 [DL + LL] | 4643.2529 | 124.173 | 11.9286 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4567.4391 | -18.1137 | 9.7495 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4643.2529 | 11.9286 | 9.7495 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.562 | 201] 1.5 [DL + LL] | 4917.4924 | -122.172 | -19.028 |
| Bottom | 0.568 | 201] 1.5 [DL + LL] | 4993.3062 | 120.1461 | 14.5854 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4917.4924 | -19.028 | 10.8863 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4993.3062 | 14.5854 | 10.8863 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.596 | 201] 1.5 [DL + LL] | 5264.5702 | -118.4772 | -17.3819 |
| Bottom | 0.604 | 201] 1.5 [DL + LL] | 5340.384 | 116.2326 | 28.8823 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5264.5702 | -17.3819 | 14.9208 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5340.384 | 28.8823 | 14.9208 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.633 | 201] 1.5 [DL + LL] | 5608.3364 | -114.1706 | -3.6191 |
| Bottom | 0.64 | 201] 1.5 [DL + LL] | 5684.1503 | 111.8939 | 27.1303 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5608.3364 | -3.6191 | 10.0692 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5684.1503 | 27.1303 | 10.0692 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.668 | 201] 1.5 [DL + LL] | 5946.6678 | -107.7746 | -4.6646 |
| Bottom | 0.681 | 201] 1.5 [DL + LL] | 6022.4816 | 103.5995 | -345.3548 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5946.6678 | -4.6646 | -108.0643 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6022.4816 | -345.3548 | -108.0643 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 201] 1.5 [DL + LL] | 6297.5006 | -126.6717 | 821.7567 |
| Bottom | 0.594 | 201] 1.5 [DL + LL] | 6391.9727 | 119.0007 | 51.7182 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6297.5006 | 821.7567 | -244.5838 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6391.9727 | 51.7182 | -244.5838 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 201] 1.5 [DL + LL] | 6651.9767 | -109.5265 | 59.4116 |
| Bottom | 0.624 | 201] 1.5 [DL + LL] | 6746.4488 | 110.0851 | -43.5229 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6651.9767 | 59.4116 | -32.3732 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6746.4488 | -43.5229 | -32.3732 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.648 | 201] 1.5 [DL + LL] | 7007.1771 | -111.1112 | -40.7149 |
| Bottom | 0.656 | 201] 1.5 [DL + LL] | 7101.6492 | 108.7506 | -16.9404 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7007.1771 | -40.7149 | 7.7733 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7101.6492 | -16.9404 | 7.7733 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.679 | 201] 1.5 [DL + LL] | 7362.243 | -106.0783 | -20.1308 |
| Bottom | 0.687 | 201] 1.5 [DL + LL] | 7456.7151 | 104.2968 | -2.756 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7362.243 | -20.1308 | 5.6842 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7456.7151 | -2.756 | 5.6842 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 201] 1.5 [DL + LL] | 7716.6128 | -102.5244 | -11.4445 |
| Bottom | 0.718 | 201] 1.5 [DL + LL] | 7811.0849 | 100.2554 | 2.3001 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7716.6128 | -11.4445 | 4.513 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7811.0849 | 2.3001 | 4.513 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.741 | 201] 1.5 [DL + LL] | 8070.0293 | -98.2227 | -11.827 |
| Bottom | 0.749 | 201] 1.5 [DL + LL] | 8164.5014 | 95.6731 | 7.2845 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8070.0293 | -11.827 | 6.2093 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8164.5014 | 7.2845 | 6.2093 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.771 | 201] 1.5 [DL + LL] | 8422.2328 | -93.8747 | -12.4525 |
| Bottom | 0.779 | 201] 1.5 [DL + LL] | 8516.7049 | 91.3846 | 8.8307 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8422.2328 | -12.4525 | 6.8977 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8516.7049 | 8.8307 | 6.8977 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.801 | 201] 1.5 [DL + LL] | 8773.0987 | -88.2686 | -16.8504 |
| Bottom | 0.809 | 201] 1.5 [DL + LL] | 8867.5708 | 83.3664 | -18.9804 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8773.0987 | -16.8504 | -0.5559 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8867.5708 | -18.9804 | -0.5559 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.832 | 201] 1.5 [DL + LL] | 9122.0354 | -87.5237 | -51.2381 |
| Bottom | 0.842 | 201] 1.5 [DL + LL] | 9219.5066 | 99.8764 | -109.54 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9122.0354 | -51.2381 | -18.0234 | 662.5252 | 1124.4382 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9219.5066 | -109.54 | -18.0234 | 662.5252 | 1124.4382 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 201] 1.5 [DL + LL] | 9650.7958 | -81.0376 | 176.4063 |
| Bottom | 0.874 | 201] 1.5 [DL + LL] | 9776.7586 | 75.7109 | -107.5871 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9650.7958 | 176.4063 | -67.6537 | 444.5515 | 906.4646 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9776.7586 | -107.5871 | -67.6537 | 444.5515 | 906.4646 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.9 | 201] 1.5 [DL + LL] | 10129.9682 | -46.9231 | 79.2923 |
| Bottom | 0.907 | 201] 1.5 [DL + LL] | 10250.5326 | 24.7731 | -48.7361 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10129.9682 | 79.2923 | -31.823 | 470.1086 | 932.0217 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10250.5326 | -48.7361 | -31.823 | 470.1086 | 932.0217 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.36 | 201] 1.5 [DL + LL] | 2036.3675 | 157.8834 | 226.4396 |
| Bottom | 0.306 | 201] 1.5 [DL + LL] | 2112.1813 | -130.2895 | 4.2175 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2036.3675 | 226.4396 | -70.5127 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2112.1813 | 4.2175 | -70.5127 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.32 | 201] 1.5 [DL + LL] | 2420.1813 | 108.9666 | 58.8982 |
| Bottom | 0.329 | 201] 1.5 [DL + LL] | 2495.9951 | -113.6376 | -35.9405 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2420.1813 | 58.8982 | -29.9646 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2495.9951 | -35.9405 | -29.9646 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.36 | 201] 1.5 [DL + LL] | 2799.6641 | 118.8678 | 16.6268 |
| Bottom | 0.366 | 201] 1.5 [DL + LL] | 2875.478 | -115.67 | -30.0543 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2799.6641 | 16.6268 | -14.6629 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2875.478 | -30.0543 | -14.6629 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.394 | 201] 1.5 [DL + LL] | 3175.3239 | 115.2169 | 19.598 |
| Bottom | 0.401 | 201] 1.5 [DL + LL] | 3251.1378 | -113.5706 | -25.8243 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3175.3239 | 19.598 | -14.2584 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3251.1378 | -25.8243 | -14.2584 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.43 | 201] 1.5 [DL + LL] | 3547.1355 | 114.0778 | 21.6538 |
| Bottom | 0.437 | 201] 1.5 [DL + LL] | 3622.9494 | -112.1129 | -24.9922 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3547.1355 | 21.6538 | -14.6365 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3622.9494 | -24.9922 | -14.6365 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.465 | 201] 1.5 [DL + LL] | 3915.287 | 112.1675 | 20.9092 |
| Bottom | 0.472 | 201] 1.5 [DL + LL] | 3991.1009 | -110.2333 | -24.6093 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3915.287 | 20.9092 | -14.2687 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3991.1009 | -24.6093 | -14.2687 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.493 | 201] 1.5 [DL + LL] | 4279.7944 | 110.1668 | 20.1168 |
| Bottom | 0.499 | 201] 1.5 [DL + LL] | 4355.6083 | -108.1331 | -24.1863 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4279.7944 | 20.1168 | -13.8756 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4355.6083 | -24.1863 | -13.8756 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.526 | 201] 1.5 [DL + LL] | 4640.6391 | 107.9464 | 19.715 |
| Bottom | 0.534 | 201] 1.5 [DL + LL] | 4716.4529 | -105.8118 | -23.8263 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4640.6391 | 19.715 | -13.6286 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4716.4529 | -23.8263 | -13.6286 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.564 | 201] 1.5 [DL + LL] | 4997.7451 | 105.4532 | 19.5585 |
| Bottom | 0.572 | 201] 1.5 [DL + LL] | 5073.5589 | -103.0618 | -26.1757 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4997.7451 | 19.5585 | -14.3229 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5073.5589 | -26.1757 | -14.3229 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.602 | 201] 1.5 [DL + LL] | 5350.9691 | 102.9518 | 16.8515 |
| Bottom | 0.609 | 201] 1.5 [DL + LL] | 5426.7829 | -100.3594 | -40.3044 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5350.9691 | 16.8515 | -17.9686 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5426.7829 | -40.3044 | -17.9686 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.639 | 201] 1.5 [DL + LL] | 5700.0323 | 99.9088 | 1.9507 |
| Bottom | 0.646 | 201] 1.5 [DL + LL] | 5775.8462 | -97.3347 | -38.4707 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5700.0323 | 1.9507 | -12.7394 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5775.8462 | -38.4707 | -12.7394 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.675 | 201] 1.5 [DL + LL] | 6043.0405 | 94.5488 | 1.9815 |
| Bottom | 0.685 | 201] 1.5 [DL + LL] | 6118.8543 | -90.7039 | 339.6789 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6043.0405 | 1.9815 | 107.5106 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6118.8543 | 339.6789 | 107.5106 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.614 | 201] 1.5 [DL + LL] | 6399.8233 | 109.92 | -838.3113 |
| Bottom | 0.6 | 201] 1.5 [DL + LL] | 6494.2954 | -102.1702 | -68.8041 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6399.8233 | -838.3113 | 244.7921 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6494.2954 | -68.8041 | 244.7921 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.622 | 201] 1.5 [DL + LL] | 6761.8325 | 96.6222 | -67.6967 |
| Bottom | 0.632 | 201] 1.5 [DL + LL] | 6856.3046 | -96.2024 | 29.4018 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6761.8325 | -67.6967 | 30.8716 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6856.3046 | 29.4018 | 30.8716 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.656 | 201] 1.5 [DL + LL] | 7122.8083 | 98.9418 | 33.6369 |
| Bottom | 0.664 | 201] 1.5 [DL + LL] | 7217.2804 | -96.0025 | 3.827 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7122.8083 | 33.6369 | -9.3563 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7217.2804 | 3.827 | -9.3563 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.688 | 201] 1.5 [DL + LL] | 7482.8832 | 95.5271 | 13.0683 |
| Bottom | 0.696 | 201] 1.5 [DL + LL] | 7577.3553 | -93.0339 | -10.0012 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7482.8832 | 13.0683 | -7.1785 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7577.3553 | -10.0012 | -7.1785 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.72 | 201] 1.5 [DL + LL] | 7841.4442 | 93.3985 | 3.7465 |
| Bottom | 0.727 | 201] 1.5 [DL + LL] | 7935.9163 | -90.4012 | -14.7551 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7841.4442 | 3.7465 | -5.7335 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7935.9163 | -14.7551 | -5.7335 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.751 | 201] 1.5 [DL + LL] | 8198.3711 | 90.5669 | 3.5564 |
| Bottom | 0.758 | 201] 1.5 [DL + LL] | 8292.8432 | -87.3081 | -19.1721 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8198.3711 | 3.5564 | -7.0959 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8292.8432 | -19.1721 | -7.0959 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.782 | 201] 1.5 [DL + LL] | 8553.519 | 87.5498 | 3.9831 |
| Bottom | 0.789 | 201] 1.5 [DL + LL] | 8647.9911 | -84.0783 | -19.32 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8553.519 | 3.9831 | -7.3081 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8647.9911 | -19.32 | -7.3081 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.813 | 201] 1.5 [DL + LL] | 8906.7586 | 83.9728 | 9.0452 |
| Bottom | 0.82 | 201] 1.5 [DL + LL] | 9001.2307 | -79.4895 | 6.3364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8906.7586 | 9.0452 | -0.7811 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9001.2307 | 6.3364 | -0.7811 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 201] 1.5 [DL + LL] | 9258.1958 | 81.3557 | 41.1697 |
| Bottom | 0.852 | 201] 1.5 [DL + LL] | 9355.667 | -86.0689 | 58.8145 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9258.1958 | 41.1697 | 5.649 | 662.5252 | 1124.4382 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9355.667 | 58.8145 | 5.649 | 662.5252 | 1124.4382 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.868 | 201] 1.5 [DL + LL] | 9730.7862 | 71.128 | -157.455 |
| Bottom | 0.88 | 201] 1.5 [DL + LL] | 9856.749 | -69.4424 | 98.5918 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9730.7862 | -157.455 | 61.0719 | 444.5515 | 906.4646 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9856.749 | 98.5918 | 61.0719 | 444.5515 | 906.4646 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.907 | 201] 1.5 [DL + LL] | 10216.7389 | 45.9625 | -92.1228 |
| Bottom | 0.914 | 201] 1.5 [DL + LL] | 10337.3033 | -23.4433 | 37.9946 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10216.7389 | -92.1228 | 32.3796 | 470.1086 | 932.0217 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10337.3033 | 37.9946 | 32.3796 | 470.1086 | 932.0217 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.354 | 201] 1.5 [DL + LL] | 2003.5899 | 155.6309 | -214.457 |
| Bottom | 0.304 | 201] 1.5 [DL + LL] | 2079.4037 | -129.3136 | -13.9774 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2003.5899 | -214.457 | 63.8326 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2079.4037 | -13.9774 | 63.8326 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.313 | 201] 1.5 [DL + LL] | 2371.3353 | 105.8052 | -54.0454 |
| Bottom | 0.321 | 201] 1.5 [DL + LL] | 2447.1492 | -111.3953 | 26.4689 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2371.3353 | -54.0454 | 25.682 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2447.1492 | 26.4689 | 25.682 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.351 | 201] 1.5 [DL + LL] | 2736.6345 | 116.4625 | -13.5507 |
| Bottom | 0.357 | 201] 1.5 [DL + LL] | 2812.4483 | -113.5077 | 21.0168 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2736.6345 | -13.5507 | 11.1153 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2812.4483 | 21.0168 | 11.1153 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.385 | 201] 1.5 [DL + LL] | 3099.3808 | 112.7358 | -17.628 |
| Bottom | 0.391 | 201] 1.5 [DL + LL] | 3175.1946 | -111.3557 | 17.0196 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3099.3808 | -17.628 | 11.1649 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3175.1946 | 17.0196 | 11.1649 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.42 | 201] 1.5 [DL + LL] | 3459.5708 | 111.7195 | -20.926 |
| Bottom | 0.426 | 201] 1.5 [DL + LL] | 3535.3846 | -109.9689 | 16.4336 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3459.5708 | -20.926 | 12.0402 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3535.3846 | 16.4336 | 12.0402 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.454 | 201] 1.5 [DL + LL] | 3817.3306 | 109.964 | -21.2927 |
| Bottom | 0.46 | 201] 1.5 [DL + LL] | 3893.1445 | -108.2404 | 16.3142 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3817.3306 | -21.2927 | 12.129 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3893.1445 | 16.3142 | 12.129 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.481 | 201] 1.5 [DL + LL] | 4172.6557 | 108.1544 | -21.5136 |
| Bottom | 0.486 | 201] 1.5 [DL + LL] | 4248.4696 | -106.3576 | 16.1626 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4172.6557 | -21.5136 | 12.1591 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4248.4696 | 16.1626 | 12.1591 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.514 | 201] 1.5 [DL + LL] | 4525.5251 | 106.1531 | -22.0573 |
| Bottom | 0.521 | 201] 1.5 [DL + LL] | 4601.339 | -104.2975 | 16.1029 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4525.5251 | -22.0573 | 12.318 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4601.339 | 16.1029 | 12.318 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.551 | 201] 1.5 [DL + LL] | 4875.8821 | 103.9278 | -22.7766 |
| Bottom | 0.559 | 201] 1.5 [DL + LL] | 4951.696 | -101.9188 | 18.7924 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4875.8821 | -22.7766 | 13.4036 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4951.696 | 18.7924 | 13.4036 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.588 | 201] 1.5 [DL + LL] | 5223.6455 | 101.624 | -20.9052 |
| Bottom | 0.595 | 201] 1.5 [DL + LL] | 5299.4593 | -99.3857 | 33.0767 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5223.6455 | -20.9052 | 17.3636 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5299.4593 | 33.0767 | 17.3636 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.625 | 201] 1.5 [DL + LL] | 5568.5134 | 99.0764 | -6.9776 |
| Bottom | 0.632 | 201] 1.5 [DL + LL] | 5644.3273 | -97.0892 | 31.1546 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5568.5134 | -6.9776 | 12.4067 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5644.3273 | 31.1546 | 12.4067 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 201] 1.5 [DL + LL] | 5909.142 | 94.0969 | -8.4478 |
| Bottom | 0.671 | 201] 1.5 [DL + LL] | 5984.9558 | -91.4212 | -339.3845 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5909.142 | -8.4478 | -104.9702 | 389.6011 | 760.2863 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5984.9558 | -339.3845 | -104.9702 | 389.6011 | 760.2863 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.601 | 201] 1.5 [DL + LL] | 6263.3537 | 107.801 | 811.9977 |
| Bottom | 0.587 | 201] 1.5 [DL + LL] | 6357.8258 | -100.3028 | 56.5807 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6263.3537 | 811.9977 | -239.9416 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6357.8258 | 56.5807 | -239.9416 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.611 | 201] 1.5 [DL + LL] | 6623.7036 | 98.654 | 55.8032 |
| Bottom | 0.619 | 201] 1.5 [DL + LL] | 6718.1757 | -97.0002 | -39.6737 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6623.7036 | 55.8032 | -30.0083 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6718.1757 | -39.6737 | -30.0083 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.643 | 201] 1.5 [DL + LL] | 6982.802 | 98.4934 | -43.9859 |
| Bottom | 0.652 | 201] 1.5 [DL + LL] | 7077.2741 | -95.7302 | -13.7184 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6982.802 | -43.9859 | 9.833 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7077.2741 | -13.7184 | 9.833 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.675 | 201] 1.5 [DL + LL] | 7341.3103 | 95.1546 | -23.8178 |
| Bottom | 0.683 | 201] 1.5 [DL + LL] | 7435.7824 | -92.556 | 0.4472 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7341.3103 | -23.8178 | 7.8695 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7435.7824 | 0.4472 | 7.8695 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.706 | 201] 1.5 [DL + LL] | 7698.5821 | 92.6785 | -14.8173 |
| Bottom | 0.714 | 201] 1.5 [DL + LL] | 7793.0542 | -89.6452 | 5.6382 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7698.5821 | -14.8173 | 6.641 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7793.0542 | 5.6382 | 6.641 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.738 | 201] 1.5 [DL + LL] | 8054.5113 | 89.5516 | -14.8332 |
| Bottom | 0.745 | 201] 1.5 [DL + LL] | 8148.9834 | -86.3071 | 10.4076 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8054.5113 | -14.8332 | 8.1529 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8148.9834 | 10.4076 | 8.1529 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.769 | 201] 1.5 [DL + LL] | 8408.9934 | 86.2146 | -15.5453 |
| Bottom | 0.776 | 201] 1.5 [DL + LL] | 8503.4655 | -82.7169 | 10.4227 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8408.9934 | -15.5453 | 8.382 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8503.4655 | 10.4227 | 8.382 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.799 | 201] 1.5 [DL + LL] | 8761.8266 | 82.5739 | -21.3004 |
| Bottom | 0.807 | 201] 1.5 [DL + LL] | 8856.2987 | -78.7454 | -16.7934 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8761.8266 | -21.3004 | 1.5427 | 706.4192 | 1168.3323 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8856.2987 | -16.7934 | 1.5427 | 706.4192 | 1168.3323 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.829 | 201] 1.5 [DL + LL] | 9113.7731 | 78.1332 | -56.0459 |
| Bottom | 0.838 | 201] 1.5 [DL + LL] | 9211.2443 | -81.2538 | -75.9032 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9113.7731 | -56.0459 | -6.1902 | 662.5252 | 1124.4382 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9211.2443 | -75.9032 | -6.1902 | 662.5252 | 1124.4382 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.855 | 201] 1.5 [DL + LL] | 9579.6624 | 68.7189 | 149.0649 |
| Bottom | 0.867 | 201] 1.5 [DL + LL] | 9705.6252 | -69.3116 | -105.7908 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9579.6624 | 149.0649 | -60.7103 | 444.5515 | 906.4646 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9705.6252 | -105.7908 | -60.7103 | 444.5515 | 906.4646 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.894 | 201] 1.5 [DL + LL] | 10057.5178 | 47.9193 | 81.4147 |
| Bottom | 0.9 | 201] 1.5 [DL + LL] | 10178.0822 | -24.6946 | -44.9661 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10057.5178 | 81.4147 | -31.4242 | 470.1086 | 932.0217 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10178.0822 | -44.9661 | -31.4242 | 470.1086 | 932.0217 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.967 | 201] 1.5 [DL + LL] | 1821.8367 | 157.5096 | 744.8127 |
| Bottom | 0.625 | 201] 1.5 [DL + LL] | 1878.5199 | -145.2439 | -210.9127 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1821.8367 | 744.8127 | -303.6599 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1878.5199 | -210.9127 | -303.6599 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.564 | 201] 1.5 [DL + LL] | 2052.8335 | 131.3065 | 143.9974 |
| Bottom | 0.579 | 201] 1.5 [DL + LL] | 2109.5168 | -131.9546 | -171.6727 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2052.8335 | 143.9974 | -100.3996 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2109.5168 | -171.6727 | -100.3996 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.566 | 201] 1.5 [DL + LL] | 2287.2765 | 131.3532 | 173.6965 |
| Bottom | 0.566 | 201] 1.5 [DL + LL] | 2343.9597 | -129.6469 | -166.0903 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2287.2765 | 173.6965 | -108.083 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2343.9597 | -166.0903 | -108.083 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.58 | 201] 1.5 [DL + LL] | 2524.8837 | 126.7068 | 175.654 |
| Bottom | 0.579 | 201] 1.5 [DL + LL] | 2581.567 | -125.2579 | -165.1277 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2524.8837 | 175.654 | -108.4054 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2581.567 | -165.1277 | -108.4054 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.606 | 201] 1.5 [DL + LL] | 2766.0913 | 122.2772 | 172.2029 |
| Bottom | 0.608 | 201] 1.5 [DL + LL] | 2822.7745 | -120.6357 | -163.2715 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2766.0913 | 172.2029 | -106.726 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2822.7745 | -163.2715 | -106.726 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.627 | 201] 1.5 [DL + LL] | 3011.5008 | 117.3263 | 168.6799 |
| Bottom | 0.63 | 201] 1.5 [DL + LL] | 3068.184 | -115.5272 | -160.6506 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3011.5008 | 168.6799 | -104.7813 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3068.184 | -160.6506 | -104.7813 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.637 | 201] 1.5 [DL + LL] | 3261.7304 | 111.9022 | 164.9613 |
| Bottom | 0.639 | 201] 1.5 [DL + LL] | 3318.4136 | -109.9315 | -157.3542 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3261.7304 | 164.9613 | -102.5601 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3318.4136 | -157.3542 | -102.5601 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.659 | 201] 1.5 [DL + LL] | 3517.4371 | 105.9463 | 160.9628 |
| Bottom | 0.661 | 201] 1.5 [DL + LL] | 3574.1204 | -103.7945 | -153.4117 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3517.4371 | 160.9628 | -100.0442 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3574.1204 | -153.4117 | -100.0442 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.68 | 201] 1.5 [DL + LL] | 3779.3224 | 99.4339 | 156.6339 |
| Bottom | 0.684 | 201] 1.5 [DL + LL] | 3836.0056 | -97.0761 | -149.3202 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3779.3224 | 156.6339 | -97.3752 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3836.0056 | -149.3202 | -97.3752 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.709 | 201] 1.5 [DL + LL] | 4048.1422 | 92.3453 | 151.3871 |
| Bottom | 0.714 | 201] 1.5 [DL + LL] | 4104.8255 | -89.8272 | -144.4431 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4048.1422 | 151.3871 | -94.1657 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4104.8255 | -144.4431 | -94.1657 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.74 | 201] 1.5 [DL + LL] | 4324.8494 | 84.4251 | 145.6315 |
| Bottom | 0.741 | 201] 1.5 [DL + LL] | 4381.5327 | -81.867 | -99.9881 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4324.8494 | 145.6315 | -78.2013 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4381.5327 | -99.9881 | -78.2013 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.773 | 201] 1.5 [DL + LL] | 4608.6418 | 74.8148 | 182.9683 |
| Bottom | 0.791 | 201] 1.5 [DL + LL] | 4665.325 | -70.4637 | -411.3416 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4608.6418 | 182.9683 | -188.9517 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4665.325 | -411.3416 | -188.9517 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 201] 1.5 [DL + LL] | 4922.962 | 85.0786 | 1301.5612 |
| Bottom | 0.626 | 201] 1.5 [DL + LL] | 5000.9015 | -80.1107 | -198.3919 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4922.962 | 1301.5612 | -476.6069 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5000.9015 | -198.3919 | -476.6069 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.644 | 201] 1.5 [DL + LL] | 5227.4053 | 72.94 | 195.8179 |
| Bottom | 0.653 | 201] 1.5 [DL + LL] | 5305.3448 | -72.0745 | -205.2755 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5227.4053 | 195.8179 | -127.5197 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5305.3448 | -205.2755 | -127.5197 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.673 | 201] 1.5 [DL + LL] | 5533.7993 | 69.8827 | 170.3654 |
| Bottom | 0.681 | 201] 1.5 [DL + LL] | 5611.7388 | -67.748 | -174.562 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5533.7993 | 170.3654 | -109.7316 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5611.7388 | -174.562 | -109.7316 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.704 | 201] 1.5 [DL + LL] | 5842.5369 | 64.1033 | 184.322 |
| Bottom | 0.711 | 201] 1.5 [DL + LL] | 5920.4764 | -62.0203 | -164.2593 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5842.5369 | 184.322 | -110.8898 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5920.4764 | -164.2593 | -110.8898 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 201] 1.5 [DL + LL] | 6154.0046 | 57.9659 | 177.4262 |
| Bottom | 0.746 | 201] 1.5 [DL + LL] | 6231.9441 | -55.691 | -155.182 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6154.0046 | 177.4262 | -105.804 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6231.9441 | -155.182 | -105.804 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.771 | 201] 1.5 [DL + LL] | 6468.9966 | 51.2286 | 167.5116 |
| Bottom | 0.78 | 201] 1.5 [DL + LL] | 6546.9361 | -48.7576 | -144.6 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6468.9966 | 167.5116 | -99.2792 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6546.9361 | -144.6 | -99.2792 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.806 | 201] 1.5 [DL + LL] | 6788.3427 | 43.8566 | 157.129 |
| Bottom | 0.815 | 201] 1.5 [DL + LL] | 6866.2821 | -41.1697 | -131.5471 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6788.3427 | 157.129 | -91.8172 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6866.2821 | -131.5471 | -91.8172 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.841 | 201] 1.5 [DL + LL] | 7112.702 | 35.8545 | 147.0619 |
| Bottom | 0.85 | 201] 1.5 [DL + LL] | 7190.6415 | -33.3207 | -117.444 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7112.702 | 147.0619 | -84.1132 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7190.6415 | -117.444 | -84.1132 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 201] 1.5 [DL + LL] | 7443.4411 | 26.1572 | 137.228 |
| Bottom | 0.886 | 201] 1.5 [DL + LL] | 7523.8549 | -22.8127 | -108.7848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7443.4411 | 137.228 | -75.7957 | 675.4828 | 1056.561 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7523.8549 | -108.7848 | -75.7957 | 675.4828 | 1056.561 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.04 | 201] 1.5 [DL + LL] | 7774.0976 | 233.5334 | 99.8139 |
| Bottom | 1.056 | 201] 1.5 [DL + LL] | 7878.0169 | -236.5886 | -133.3183 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7774.0976 | 99.8139 | -55.6143 | 416.4444 | 797.5227 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7878.0169 | -133.3183 | -55.6143 | 416.4444 | 797.5227 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.073 | 201] 1.5 [DL + LL] | 8205.951 | 222.7617 | 96.1192 |
| Bottom | 1.079 | 201] 1.5 [DL + LL] | 8305.4167 | -225.4407 | 14.765 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8205.951 | 96.1192 | -20.3428 | 444.7603 | 825.8386 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8305.4167 | 14.765 | -20.3428 | 444.7603 | 825.8386 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.981 | 201] 1.5 [DL + LL] | 1881.8353 | -157.1064 | 787.0693 |
| Bottom | 0.634 | 201] 1.5 [DL + LL] | 1938.5186 | 144.9353 | -230.3644 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1881.8353 | 787.0693 | -323.2216 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1938.5186 | -230.3644 | -323.2216 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.569 | 201] 1.5 [DL + LL] | 2092.947 | -131.4028 | 146.9265 |
| Bottom | 0.586 | 201] 1.5 [DL + LL] | 2149.6302 | 132.166 | -183.433 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2092.947 | 146.9265 | -105.0345 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2149.6302 | -183.433 | -105.0345 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.571 | 201] 1.5 [DL + LL] | 2309.5009 | -131.7168 | 181.8748 |
| Bottom | 0.572 | 201] 1.5 [DL + LL] | 2366.1841 | 130.2123 | -176.2106 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2309.5009 | 181.8748 | -113.8656 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2366.1841 | -176.2106 | -113.8656 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.584 | 201] 1.5 [DL + LL] | 2530.9279 | -127.337 | 184.0212 |
| Bottom | 0.584 | 201] 1.5 [DL + LL] | 2587.6111 | 126.1261 | -174.4992 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2530.9279 | 184.0212 | -114.0085 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2587.6111 | -174.4992 | -114.0085 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.61 | 201] 1.5 [DL + LL] | 2757.4793 | -123.1535 | 180.1394 |
| Bottom | 0.61 | 201] 1.5 [DL + LL] | 2814.1626 | 121.7847 | -171.9683 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2757.4793 | 180.1394 | -111.9762 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2814.1626 | -171.9683 | -111.9762 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.628 | 201] 1.5 [DL + LL] | 2989.6232 | -118.4576 | 176.2775 |
| Bottom | 0.631 | 201] 1.5 [DL + LL] | 3046.3065 | 116.96 | -168.8809 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2989.6232 | 176.2775 | -109.7741 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3046.3065 | -168.8809 | -109.7741 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.636 | 201] 1.5 [DL + LL] | 3227.8651 | -113.3118 | 172.1677 |
| Bottom | 0.639 | 201] 1.5 [DL + LL] | 3284.5484 | 111.6688 | -165.2803 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3227.8651 | 172.1677 | -107.3306 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3284.5484 | -165.2803 | -107.3306 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.657 | 201] 1.5 [DL + LL] | 3472.7825 | -107.6716 | 167.7458 |
| Bottom | 0.66 | 201] 1.5 [DL + LL] | 3529.4658 | 105.8712 | -161.1723 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3472.7825 | 167.7458 | -104.6268 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3529.4658 | -161.1723 | -104.6268 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 201] 1.5 [DL + LL] | 3725.0292 | -101.5293 | 162.9665 |
| Bottom | 0.681 | 201] 1.5 [DL + LL] | 3781.7125 | 99.5472 | -157.0591 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3725.0292 | 162.9665 | -101.8082 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3781.7125 | -157.0591 | -101.8082 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.704 | 201] 1.5 [DL + LL] | 3985.3516 | -94.8794 | 157.2148 |
| Bottom | 0.709 | 201] 1.5 [DL + LL] | 4042.0349 | 92.7524 | -151.8506 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3985.3516 | 157.2148 | -98.335 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4042.0349 | -151.8506 | -98.335 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.734 | 201] 1.5 [DL + LL] | 4254.6793 | -87.4623 | 151.4068 |
| Bottom | 0.736 | 201] 1.5 [DL + LL] | 4311.3625 | 85.3296 | -109.571 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4254.6793 | 151.4068 | -83.0487 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4311.3625 | -109.571 | -83.0487 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.767 | 201] 1.5 [DL + LL] | 4532.467 | -78.6421 | 186.1104 |
| Bottom | 0.788 | 201] 1.5 [DL + LL] | 4589.1503 | 74.7608 | -415.4538 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4532.467 | 186.1104 | -191.2356 | 290.0456 | 567.1934 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4589.1503 | -415.4538 | -191.2356 | 290.0456 | 567.1934 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.711 | 201] 1.5 [DL + LL] | 4846.8314 | -90.6148 | 1283.6465 |
| Bottom | 0.622 | 201] 1.5 [DL + LL] | 4924.7709 | 85.8973 | -193.1953 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4846.8314 | 1283.6465 | -469.2674 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4924.7709 | -193.1953 | -469.2674 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.641 | 201] 1.5 [DL + LL] | 5151.677 | -77.4187 | 208.651 |
| Bottom | 0.649 | 201] 1.5 [DL + LL] | 5229.6165 | 76.8554 | -207.4045 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5151.677 | 208.651 | -132.2583 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5229.6165 | -207.4045 | -132.2583 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.669 | 201] 1.5 [DL + LL] | 5458.0515 | -73.8726 | 175.0082 |
| Bottom | 0.676 | 201] 1.5 [DL + LL] | 5535.9909 | 71.9328 | -177.5749 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5458.0515 | 175.0082 | -112.1441 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5535.9909 | -177.5749 | -112.1441 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.698 | 201] 1.5 [DL + LL] | 5766.3951 | -67.5245 | 186.5096 |
| Bottom | 0.704 | 201] 1.5 [DL + LL] | 5844.3346 | 65.6483 | -166.3593 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5766.3951 | 186.5096 | -112.2325 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5844.3346 | -166.3593 | -112.2325 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.729 | 201] 1.5 [DL + LL] | 6077.1751 | -60.8426 | 179.0156 |
| Bottom | 0.738 | 201] 1.5 [DL + LL] | 6155.1146 | 58.7733 | -156.7476 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6077.1751 | 179.0156 | -106.787 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6155.1146 | -156.7476 | -106.787 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.763 | 201] 1.5 [DL + LL] | 6391.1962 | -53.5968 | 168.192 |
| Bottom | 0.772 | 201] 1.5 [DL + LL] | 6469.1357 | 51.3355 | -145.7179 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6391.1962 | 168.192 | -99.8319 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6469.1357 | -145.7179 | -99.8319 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.798 | 201] 1.5 [DL + LL] | 6709.3057 | -45.7069 | 156.8378 |
| Bottom | 0.807 | 201] 1.5 [DL + LL] | 6787.2452 | 43.2079 | -132.3479 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6709.3057 | 156.8378 | -91.9622 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6787.2452 | -132.3479 | -91.9622 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.833 | 201] 1.5 [DL + LL] | 7032.1751 | -37.2729 | 145.6834 |
| Bottom | 0.842 | 201] 1.5 [DL + LL] | 7110.1146 | 35.0931 | -118.77 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7032.1751 | 145.6834 | -84.0831 | 732.8874 | 1113.9656 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7110.1146 | -118.77 | -84.0831 | 732.8874 | 1113.9656 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.867 | 201] 1.5 [DL + LL] | 7361.2491 | -26.6049 | 133.8339 |
| Bottom | 0.876 | 201] 1.5 [DL + LL] | 7441.6629 | 22.7019 | -118.3127 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7361.2491 | 133.8339 | -77.682 | 675.4828 | 1056.561 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7441.6629 | -118.3127 | -77.682 | 675.4828 | 1056.561 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.031 | 201] 1.5 [DL + LL] | 7681.7758 | -232.9358 | 110.8422 |
| Bottom | 1.047 | 201] 1.5 [DL + LL] | 7785.6951 | 235.991 | -146.6922 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7681.7758 | 110.8422 | -61.4284 | 416.4444 | 797.5227 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7785.6951 | -146.6922 | -61.4284 | 416.4444 | 797.5227 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.052 | 201] 1.5 [DL + LL] | 8087.6658 | -212.6902 | 110.1762 |
| Bottom | 1.056 | 201] 1.5 [DL + LL] | 8187.1314 | 215.3692 | 9.7842 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8087.6658 | 110.1762 | -25.0774 | 444.7603 | 825.8386 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8187.1314 | 9.7842 | -25.0774 | 444.7603 | 825.8386 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.514 | 201] 1.5 [DL + LL] | 1315.2823 | -85.6979 | -161.5068 |
| Bottom | 0.416 | 201] 1.5 [DL + LL] | 1357.7948 | 74.9925 | -12.8106 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1315.2823 | -161.5068 | 47.1412 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1357.7948 | -12.8106 | 47.1412 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.439 | 201] 1.5 [DL + LL] | 1576.2659 | -68.8734 | 21.8066 |
| Bottom | 0.447 | 201] 1.5 [DL + LL] | 1618.7783 | 70.0912 | -12.2232 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1576.2659 | 21.8066 | -10.9808 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1618.7783 | -12.2232 | -10.9808 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.487 | 201] 1.5 [DL + LL] | 1836.5391 | -70.0652 | 23.8401 |
| Bottom | 0.49 | 201] 1.5 [DL + LL] | 1879.0515 | 69.448 | -16.3866 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1836.5391 | 23.8401 | -12.9498 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1879.0515 | -16.3866 | -12.9498 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.527 | 201] 1.5 [DL + LL] | 2095.6483 | -68.7006 | 20.0683 |
| Bottom | 0.534 | 201] 1.5 [DL + LL] | 2138.1608 | 68.2734 | -15.8369 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2095.6483 | 20.0683 | -11.5878 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2138.1608 | -15.8369 | -11.5878 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.575 | 201] 1.5 [DL + LL] | 2353.622 | -67.8466 | 20.7934 |
| Bottom | 0.582 | 201] 1.5 [DL + LL] | 2396.1345 | 67.337 | -16.3532 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2353.622 | 20.7934 | -11.9897 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2396.1345 | -16.3532 | -11.9897 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.623 | 201] 1.5 [DL + LL] | 2610.4368 | -66.8615 | 20.4052 |
| Bottom | 0.629 | 201] 1.5 [DL + LL] | 2652.9493 | 66.3521 | -16.7083 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2610.4368 | 20.4052 | -11.9858 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2652.9493 | -16.7083 | -11.9858 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.635 | 201] 1.5 [DL + LL] | 2865.9994 | -65.8979 | 20.0442 |
| Bottom | 0.641 | 201] 1.5 [DL + LL] | 2908.5118 | 65.3583 | -16.7489 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2865.9994 | 20.0442 | -11.8907 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2908.5118 | -16.7489 | -11.8907 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.679 | 201] 1.5 [DL + LL] | 3120.2183 | -64.9076 | 19.897 |
| Bottom | 0.685 | 201] 1.5 [DL + LL] | 3162.7307 | 64.3354 | -16.3393 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3120.2183 | 19.897 | -11.7189 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3162.7307 | -16.3393 | -11.7189 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.743 | 201] 1.5 [DL + LL] | 3373.003 | -63.8581 | 20.1649 |
| Bottom | 0.747 | 201] 1.5 [DL + LL] | 3415.5154 | 63.2947 | -14.4707 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3373.003 | 20.1649 | -11.2086 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3415.5154 | -14.4707 | -11.2086 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.788 | 201] 1.5 [DL + LL] | 3624.2714 | -62.6164 | 22.0363 |
| Bottom | 0.796 | 201] 1.5 [DL + LL] | 3666.7839 | 61.6964 | -23.1899 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3624.2714 | 22.0363 | -14.5652 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3666.7839 | -23.1899 | -14.5652 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.821 | 201] 1.5 [DL + LL] | 3873.9032 | -62.2932 | 12.6983 |
| Bottom | 0.829 | 201] 1.5 [DL + LL] | 3916.4157 | 61.2661 | -54.3658 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3873.9032 | 12.6983 | -21.6166 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3916.4157 | -54.3658 | -21.6166 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.868 | 201] 1.5 [DL + LL] | 4119.4883 | -60.5996 | -24.4639 |
| Bottom | 0.895 | 201] 1.5 [DL + LL] | 4162.0007 | 60.9644 | 255.5218 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4119.4883 | -24.4639 | 88.7075 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4162.0007 | 255.5218 | 88.7075 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.795 | 201] 1.5 [DL + LL] | 4385.8941 | -99.302 | -725.884 |
| Bottom | 0.714 | 201] 1.5 [DL + LL] | 4446.1201 | 90.6725 | -52.655 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4385.8941 | -725.884 | 213.9216 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4446.1201 | -52.655 | 213.9216 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.736 | 201] 1.5 [DL + LL] | 4659.2973 | -90.6842 | -20.1396 |
| Bottom | 0.745 | 201] 1.5 [DL + LL] | 4719.5232 | 89.8976 | 30.7594 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4659.2973 | -20.1396 | 15.7895 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4719.5232 | 30.7594 | 15.7895 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.778 | 201] 1.5 [DL + LL] | 4932.7208 | -87.9455 | 65.7168 |
| Bottom | 0.78 | 201] 1.5 [DL + LL] | 4992.9468 | 87.16 | -9.632 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4932.7208 | 65.7168 | -24.1439 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4992.9468 | -9.632 | -24.1439 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.81 | 201] 1.5 [DL + LL] | 5205.1369 | -85.68 | 28.8786 |
| Bottom | 0.819 | 201] 1.5 [DL + LL] | 5265.3628 | 84.4773 | -18.4701 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5205.1369 | 28.8786 | -15.1967 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5265.3628 | -18.4701 | -15.1967 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.849 | 201] 1.5 [DL + LL] | 5475.7916 | -83.5342 | 21.4427 |
| Bottom | 0.858 | 201] 1.5 [DL + LL] | 5536.0176 | 82.0788 | -16.2907 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5475.7916 | 21.4427 | -12.1414 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5536.0176 | -16.2907 | -12.1414 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.888 | 201] 1.5 [DL + LL] | 5744.571 | -80.8948 | 25.0326 |
| Bottom | 0.896 | 201] 1.5 [DL + LL] | 5804.7969 | 79.2943 | -14.8096 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5744.571 | 25.0326 | -12.7987 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5804.7969 | -14.8096 | -12.7987 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.926 | 201] 1.5 [DL + LL] | 6011.4135 | -78.1653 | 28.3932 |
| Bottom | 0.935 | 201] 1.5 [DL + LL] | 6071.6395 | 76.6297 | -16.3965 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6011.4135 | 28.3932 | -14.3422 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6071.6395 | -16.3965 | -14.3422 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.963 | 201] 1.5 [DL + LL] | 6276.1927 | -74.5609 | 28.9739 |
| Bottom | 0.971 | 201] 1.5 [DL + LL] | 6336.4187 | 71.1223 | -9.0415 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6276.1927 | 28.9739 | -12.1546 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6336.4187 | -9.0415 | -12.1546 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.002 | 201] 1.5 [DL + LL] | 6539.1342 | -75.4265 | 38.9531 |
| Bottom | 1.014 | 201] 1.5 [DL + LL] | 6601.2721 | 83.9195 | 82.6355 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6539.1342 | 38.9531 | 13.5455 | 321.1492 | 615.6187 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6601.2721 | 82.6355 | 13.5455 | 321.1492 | 615.6187 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.267 | 201] 1.5 [DL + LL] | 7018.5774 | -243.1586 | -154.0296 |
| Bottom | 1.274 | 201] 1.5 [DL + LL] | 7098.8786 | 245.5195 | 118.9009 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7018.5774 | -154.0296 | 65.0218 | 237.326 | 531.7956 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7098.8786 | 118.9009 | 65.0218 | 237.326 | 531.7956 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.247 | 201] 1.5 [DL + LL] | 7603.7122 | -176.5394 | -91.7778 |
| Bottom | 1.254 | 201] 1.5 [DL + LL] | 7680.572 | 178.6095 | 50.6751 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7603.7122 | -91.7778 | 35.4123 | 247.937 | 542.4066 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7680.572 | 50.6751 | 35.4123 | 247.937 | 542.4066 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.525 | 201] 1.5 [DL + LL] | 1792.3679 | 65.5191 | -209.3853 |
| Bottom | 0.466 | 201] 1.5 [DL + LL] | 1834.8803 | -62.0211 | -17.5753 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1792.3679 | -209.3853 | 60.7507 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1834.8803 | -17.5753 | 60.7507 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.509 | 201] 1.5 [DL + LL] | 2010.7216 | 57.2414 | 101.3813 |
| Bottom | 0.509 | 201] 1.5 [DL + LL] | 2053.234 | -57.87 | -63.1671 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2010.7216 | 101.3813 | -52.4496 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2053.234 | -63.1671 | -52.4496 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 201] 1.5 [DL + LL] | 2237.2446 | 58.716 | 57.0556 |
| Bottom | 0.549 | 201] 1.5 [DL + LL] | 2279.757 | -58.2581 | -56.4439 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2237.2446 | 57.0556 | -36.2358 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2279.757 | -56.4439 | -36.2358 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.586 | 201] 1.5 [DL + LL] | 2469.7097 | 57.8223 | 60.6564 |
| Bottom | 0.593 | 201] 1.5 [DL + LL] | 2512.2222 | -57.5568 | -55.6505 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2469.7097 | 60.6564 | -37.1349 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2512.2222 | -55.6505 | -37.1349 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.6 | 201] 1.5 [DL + LL] | 2708.9029 | 57.1081 | 58.5843 |
| Bottom | 0.607 | 201] 1.5 [DL + LL] | 2751.4153 | -56.7577 | -54.5022 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2708.9029 | 58.5843 | -36.1164 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2751.4153 | -54.5022 | -36.1164 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.644 | 201] 1.5 [DL + LL] | 2955.2061 | 56.2025 | 56.6699 |
| Bottom | 0.651 | 201] 1.5 [DL + LL] | 2997.7185 | -55.7943 | -53.1004 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2955.2061 | 56.6699 | -35.0685 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2997.7185 | -53.1004 | -35.0685 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.689 | 201] 1.5 [DL + LL] | 3209.1838 | 55.1502 | 54.7441 |
| Bottom | 0.696 | 201] 1.5 [DL + LL] | 3251.6962 | -54.6861 | -51.4372 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3209.1838 | 54.7441 | -33.9342 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3251.6962 | -51.4372 | -33.9342 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.736 | 201] 1.5 [DL + LL] | 3471.4475 | 53.9359 | 52.8347 |
| Bottom | 0.742 | 201] 1.5 [DL + LL] | 3513.96 | -53.4163 | -49.5403 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3471.4475 | 52.8347 | -32.7303 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3513.96 | -49.5403 | -32.7303 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.785 | 201] 1.5 [DL + LL] | 3742.6956 | 52.6003 | 50.906 |
| Bottom | 0.793 | 201] 1.5 [DL + LL] | 3785.2081 | -52.0314 | -47.6453 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3742.6956 | 50.906 | -31.5193 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3785.2081 | -47.6453 | -31.5193 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.841 | 201] 1.5 [DL + LL] | 4023.7182 | 51.1154 | 48.6822 |
| Bottom | 0.85 | 201] 1.5 [DL + LL] | 4066.2307 | -50.5535 | -40.4778 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4023.7182 | 48.6822 | -28.5311 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4066.2307 | -40.4778 | -28.5311 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.898 | 201] 1.5 [DL + LL] | 4315.1608 | 49.15 | 52.2367 |
| Bottom | 0.903 | 201] 1.5 [DL + LL] | 4357.6732 | -48.8647 | -91.9054 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4315.1608 | 52.2367 | -46.032 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4357.6732 | -91.9054 | -46.032 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.961 | 201] 1.5 [DL + LL] | 4619.2565 | 46.4499 | -11.6732 |
| Bottom | 0.968 | 201] 1.5 [DL + LL] | 4661.7689 | -43.8519 | 232.3883 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4619.2565 | -11.6732 | 77.2971 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4661.7689 | 232.3883 | 77.2971 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.846 | 201] 1.5 [DL + LL] | 4928.5692 | 66.7203 | -843.5664 |
| Bottom | 0.766 | 201] 1.5 [DL + LL] | 4988.7952 | -62.0186 | 45.858 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4928.5692 | -843.5664 | 282.3892 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4988.7952 | 45.858 | 282.3892 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.8 | 201] 1.5 [DL + LL] | 5255.8097 | 53.7673 | 85.1352 |
| Bottom | 0.813 | 201] 1.5 [DL + LL] | 5316.0357 | -54.749 | -3.5417 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5255.8097 | 85.1352 | -28.4484 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5316.0357 | -3.5417 | -28.4484 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.853 | 201] 1.5 [DL + LL] | 5590.7543 | 56.1705 | 33.0024 |
| Bottom | 0.862 | 201] 1.5 [DL + LL] | 5650.9802 | -55.2622 | -15.2055 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5590.7543 | 33.0024 | -15.4963 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5650.9802 | -15.2055 | -15.4963 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.904 | 201] 1.5 [DL + LL] | 5934.5864 | 55.0599 | 13.9384 |
| Bottom | 0.913 | 201] 1.5 [DL + LL] | 5994.8124 | -54.4934 | -8.3748 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5934.5864 | 13.9384 | -7.2681 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5994.8124 | -8.3748 | -7.2681 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.956 | 201] 1.5 [DL + LL] | 6288.1859 | 54.0255 | 11.7522 |
| Bottom | 0.965 | 201] 1.5 [DL + LL] | 6348.4119 | -53.4955 | -3.0143 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6288.1859 | 11.7522 | -4.8629 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6348.4119 | -3.0143 | -4.8629 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.01 | 201] 1.5 [DL + LL] | 6652.4473 | 52.9576 | 7.8025 |
| Bottom | 1.019 | 201] 1.5 [DL + LL] | 6712.6733 | -52.3803 | 2.6121 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6652.4473 | 7.8025 | -1.8042 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6712.6733 | 2.6121 | -1.8042 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.065 | 201] 1.5 [DL + LL] | 7028.4803 | 52.0471 | 3.5996 |
| Bottom | 1.074 | 201] 1.5 [DL + LL] | 7088.7063 | -51.7604 | 10.552 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7028.4803 | 3.5996 | 2.0804 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7088.7063 | 10.552 | 2.0804 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.122 | 201] 1.5 [DL + LL] | 7417.5691 | 49.9762 | 1.1753 |
| Bottom | 1.13 | 201] 1.5 [DL + LL] | 7477.795 | -48.5824 | 11.2248 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7417.5691 | 1.1753 | 3.1103 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7477.795 | 11.2248 | 3.1103 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.182 | 201] 1.5 [DL + LL] | 7820.2844 | 52.3209 | -9.1814 |
| Bottom | 1.194 | 201] 1.5 [DL + LL] | 7882.4223 | -57.7786 | 22.7729 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7820.2844 | -9.1814 | 9.7845 | 321.1492 | 615.6187 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7882.4223 | 22.7729 | 9.7845 | 321.1492 | 615.6187 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.346 | 201] 1.5 [DL + LL] | 8270.0116 | 220.5824 | -22.2566 |
| Bottom | 1.357 | 201] 1.5 [DL + LL] | 8350.3129 | -222.9432 | 8.1383 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8270.0116 | -22.2566 | 7.1742 | 237.326 | 531.7956 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8350.3129 | 8.1383 | 7.1742 | 237.326 | 531.7956 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.476 | 201] 1.5 [DL + LL] | 8928.9171 | 256.7805 | -15.9062 |
| Bottom | 1.49 | 201] 1.5 [DL + LL] | 9005.7769 | -258.8506 | 27.8942 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8928.9171 | -15.9062 | 10.8001 | 247.937 | 542.4066 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9005.7769 | 27.8942 | 10.8001 | 247.937 | 542.4066 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.905 | 201] 1.5 [DL + LL] | 413.4938 | 189.0219 | 18.2579 |
| Bottom | 0.375 | 201] 1.5 [DL + LL] | 700.7637 | -108.1866 | 447.546 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 413.4938 | 18.2579 | 98.1061 | 3461.1684 | 4473.624 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 700.7637 | 447.546 | 98.1061 | 3461.1684 | 4473.624 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.064 | 201] 1.5 [DL + LL] | 750.7804 | 36.4799 | 480.1537 |
| Bottom | 0.17 | 201] 1.5 [DL + LL] | 974.928 | -82.929 | 891.1713 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 750.7804 | 480.1537 | 115.9965 | 3834.4961 | 4846.9517 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 974.928 | 891.1713 | 114.576 | 3834.4961 | 4846.9517 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.165 | 201] 1.5 [DL + LL] | 1137.6238 | 97.513 | 700.1867 |
| Bottom | 0.192 | 201] 1.5 [DL + LL] | 1378.5706 | -108.6043 | 998.4282 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1137.6238 | 700.1867 | 70.973 | 3768.7694 | 4781.225 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1378.5706 | 998.4282 | 70.5291 | 3768.7694 | 4781.225 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.149 | 201] 1.5 [DL + LL] | 1705.8226 | 102.482 | 717.2705 |
| Bottom | 0.192 | 201] 1.5 [DL + LL] | 1944.6993 | -131.2503 | 926.4901 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1705.8226 | 717.2705 | 40.9272 | 3795.0601 | 4807.5157 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1944.6993 | 926.4901 | 40.8248 | 3795.0601 | 4807.5157 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.183 | 201] 1.5 [DL + LL] | 2324.0403 | 130.5525 | 734.4934 |
| Bottom | 0.192 | 201] 1.5 [DL + LL] | 2566.187 | -134.4443 | 808.628 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2324.0403 | 734.4934 | -2.7373 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2566.187 | 808.628 | -2.6683 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.192 | 201] 1.5 [DL + LL] | 2937.209 | 127.3479 | 647.2327 |
| Bottom | 0.205 | 201] 1.5 [DL + LL] | 3179.6983 | -136.0376 | 675.5618 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2937.209 | 647.2327 | -17.5718 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3179.6983 | 675.5618 | -17.4899 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.207 | 201] 1.5 [DL + LL] | 3543.951 | 124.0492 | 539.1819 |
| Bottom | 0.224 | 201] 1.5 [DL + LL] | 3786.6268 | -138.3323 | 557.465 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3543.951 | 539.1819 | -20.9095 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3786.6268 | 557.465 | -20.8476 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.225 | 201] 1.5 [DL + LL] | 4145.5803 | 120.5537 | 440.8877 |
| Bottom | 0.244 | 201] 1.5 [DL + LL] | 4388.3441 | -138.5335 | 450.6365 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4145.5803 | 440.8877 | -23.6853 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4388.3441 | 450.6365 | -23.6452 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.246 | 201] 1.5 [DL + LL] | 4754.3667 | 118.8442 | 294.8951 |
| Bottom | 0.267 | 201] 1.5 [DL + LL] | 4997.3023 | -140.0717 | 469.6929 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4754.3667 | 294.8951 | 28.5746 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4997.3023 | 469.6929 | 28.5948 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.271 | 201] 1.5 [DL + LL] | 5366.5167 | 118.0326 | 301.972 |
| Bottom | 0.288 | 201] 1.5 [DL + LL] | 5609.5161 | -134.5584 | 371.9053 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5366.5167 | 301.972 | -4.759 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5609.5161 | 371.9053 | -4.7394 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.296 | 201] 1.5 [DL + LL] | 5973.5099 | 120.7582 | 221.3741 |
| Bottom | 0.312 | 201] 1.5 [DL + LL] | 6216.4474 | -133.4445 | 294.271 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5973.5099 | 221.3741 | -3.7739 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6216.4474 | 294.271 | -3.7538 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.318 | 201] 1.5 [DL + LL] | 6576.6837 | 118.7971 | 154.7673 |
| Bottom | 0.335 | 201] 1.5 [DL + LL] | 6819.507 | -132.6756 | 238.7886 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6576.6837 | 154.7673 | -0.1607 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6819.507 | 238.7886 | -0.1433 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.341 | 201] 1.5 [DL + LL] | 7176.097 | 115.8644 | 108.9386 |
| Bottom | 0.359 | 201] 1.5 [DL + LL] | 7418.7854 | -131.3858 | 201.0035 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7176.097 | 108.9386 | 2.4882 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7418.7854 | 201.0035 | 2.5026 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.365 | 201] 1.5 [DL + LL] | 7771.904 | 112.9171 | 79.3634 |
| Bottom | 0.382 | 201] 1.5 [DL + LL] | 8014.4499 | -129.6705 | 174.5947 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7771.904 | 79.3634 | 3.5936 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8014.4499 | 174.5947 | 3.6057 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.391 | 201] 1.5 [DL + LL] | 8364.1565 | 109.8238 | 60.121 |
| Bottom | 0.405 | 201] 1.5 [DL + LL] | 8606.562 | -127.576 | 155.0343 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8364.1565 | 60.121 | 3.5912 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8606.562 | 155.0343 | 3.6016 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.416 | 201] 1.5 [DL + LL] | 8952.8548 | 106.4914 | 46.8872 |
| Bottom | 0.431 | 201] 1.5 [DL + LL] | 9195.1287 | -125.057 | 140.6347 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8952.8548 | 46.8872 | 3.3138 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9195.1287 | 140.6347 | 3.323 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.44 | 201] 1.5 [DL + LL] | 9537.9641 | 102.9236 | 38.0968 |
| Bottom | 0.456 | 201] 1.5 [DL + LL] | 9780.121 | -122.1736 | 133.6859 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9537.9641 | 38.0968 | 3.9811 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9780.121 | 133.6859 | 3.9895 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.465 | 201] 1.5 [DL + LL] | 10119.446 | 99.0573 | 36.0965 |
| Bottom | 0.481 | 201] 1.5 [DL + LL] | 10361.5085 | -118.8477 | 144.3681 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10119.446 | 36.0965 | 8.075 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10361.5085 | 144.3681 | 8.0829 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.49 | 201] 1.5 [DL + LL] | 10697.1427 | 94.7844 | 51.4399 |
| Bottom | 0.506 | 201] 1.5 [DL + LL] | 10939.1312 | -111.3284 | 166.8246 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10697.1427 | 51.4399 | 10.3942 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10939.1312 | 166.8246 | 10.4009 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.516 | 201] 1.5 [DL + LL] | 11270.4035 | 93.443 | 78.904 |
| Bottom | 0.531 | 201] 1.5 [DL + LL] | 11512.3679 | -108.9446 | 153.8918 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11270.4035 | 78.904 | -2.3897 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11512.3679 | 153.8918 | -2.3847 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 201] 1.5 [DL + LL] | 11842.5847 | 92.7993 | 69.177 |
| Bottom | 0.558 | 201] 1.5 [DL + LL] | 12084.6193 | -117.9244 | 130.1144 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11842.5847 | 69.177 | -6.8821 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12084.6193 | 130.1144 | -6.8746 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.562 | 201] 1.5 [DL + LL] | 12411.9401 | 75.9998 | 41.2294 |
| Bottom | 0.582 | 201] 1.5 [DL + LL] | 12653.63 | -111.1273 | 127.6678 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12411.9401 | 41.2294 | 1.4802 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12653.63 | 127.6678 | 1.4888 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.591 | 201] 1.5 [DL + LL] | 12980.9198 | 78.107 | 33.2362 |
| Bottom | 0.606 | 201] 1.5 [DL + LL] | 13222.4749 | -107.0082 | 161.2973 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12980.9198 | 33.2362 | 14.8091 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13222.4749 | 161.2973 | 14.8123 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 201] 1.5 [DL + LL] | 13550.0361 | 77.3705 | 59.6404 |
| Bottom | 0.631 | 201] 1.5 [DL + LL] | 13791.4713 | -104.4733 | 175.5836 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13550.0361 | 59.6404 | 11.0843 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13791.4713 | 175.5836 | 11.0865 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.641 | 201] 1.5 [DL + LL] | 14119.1026 | 74.2556 | 66.7046 |
| Bottom | 0.656 | 201] 1.5 [DL + LL] | 14360.4241 | -101.9314 | 165.8188 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14119.1026 | 66.7046 | 5.868 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14360.4241 | 165.8188 | 5.8705 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.666 | 201] 1.5 [DL + LL] | 14688.2617 | 70.6415 | 48.7092 |
| Bottom | 0.681 | 201] 1.5 [DL + LL] | 14929.482 | -99.1834 | 126.2925 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14688.2617 | 48.7092 | -0.8498 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14929.482 | 126.2925 | -0.8468 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.681 | 201] 1.5 [DL + LL] | 15257.8139 | 66.6821 | -0.7209 |
| Bottom | 0.696 | 201] 1.5 [DL + LL] | 15498.9445 | -95.2055 | 42.0815 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15257.8139 | -0.7209 | -11.7945 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15498.9445 | 42.0815 | -11.7908 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.705 | 201] 1.5 [DL + LL] | 15828.2651 | 63.6878 | -97.3448 |
| Bottom | 0.72 | 201] 1.5 [DL + LL] | 16069.2827 | -89.9198 | -86.9987 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15828.2651 | -97.3448 | -22.0172 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16069.2827 | -86.9987 | -22.0163 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 201] 1.5 [DL + LL] | 16391.7941 | 62.9449 | -231.2387 |
| Bottom | 0.742 | 201] 1.5 [DL + LL] | 16639.4657 | -69.8767 | -159.1364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16391.7941 | -231.2387 | -2.5106 | 3755.624 | 4768.0797 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16639.4657 | -159.1364 | -2.5005 | 3755.624 | 4768.0797 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.889 | 201] 1.5 [DL + LL] | 17111.6918 | 526.8045 | 219.7474 |
| Bottom | 0.902 | 201] 1.5 [DL + LL] | 17421.5942 | -535.9156 | -16.1239 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17111.6918 | 219.7474 | -75.2135 | 3505.8625 | 4518.3182 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17421.5942 | -16.1239 | -75.2127 | 3505.8625 | 4518.3182 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.917 | 201] 1.5 [DL + LL] | 17880.4108 | 513.975 | 401.5635 |
| Bottom | 0.937 | 201] 1.5 [DL + LL] | 18178.4134 | -522.0014 | 749.2147 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17880.4108 | 401.5635 | 66.7039 | 3553.1858 | 4565.6414 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18178.4134 | 749.2147 | 66.6933 | 3553.1858 | 4565.6414 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.372 | 201] 1.5 [DL + LL] | 313.5778 | -235.9839 | 221.2465 |
| Bottom | 1.083 | 201] 1.5 [DL + LL] | 600.8478 | 221.8684 | 161.0742 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 313.5778 | 221.2465 | -13.8425 | 3461.1684 | 4473.624 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 600.8478 | 161.0742 | -13.8425 | 3461.1684 | 4473.624 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.089 | 201] 1.5 [DL + LL] | 829.6878 | -207.6936 | 526.0328 |
| Bottom | 0.814 | 201] 1.5 [DL + LL] | 1060.9521 | 202.9216 | 431.4284 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 829.6878 | 526.0328 | -62.2575 | 3834.4961 | 4846.9517 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1060.9521 | 431.4284 | -60.837 | 3834.4961 | 4846.9517 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.29 | 201] 1.5 [DL + LL] | 1394.1069 | -163.5585 | 436.9719 |
| Bottom | 0.143 | 201] 1.5 [DL + LL] | 1641.4404 | 109.057 | 419.5191 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1394.1069 | 436.9719 | -32.757 | 3768.7694 | 4781.225 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1641.4404 | 419.5191 | -32.3131 | 3768.7694 | 4781.225 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.154 | 201] 1.5 [DL + LL] | 1938.618 | -125.6202 | 252.0342 |
| Bottom | 0.189 | 201] 1.5 [DL + LL] | 2174.8742 | 146.4319 | 515.9187 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1938.618 | 252.0342 | 60.4336 | 3795.0601 | 4807.5157 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2174.8742 | 515.9187 | 60.5361 | 3795.0601 | 4807.5157 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.185 | 201] 1.5 [DL + LL] | 2527.0619 | -142.1748 | 424.3799 |
| Bottom | 0.198 | 201] 1.5 [DL + LL] | 2766.6217 | 145.0948 | 557.0983 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2527.0619 | 424.3799 | 17.8468 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2766.6217 | 557.0983 | 17.7778 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.202 | 201] 1.5 [DL + LL] | 3114.717 | -141.5399 | 483.6584 |
| Bottom | 0.214 | 201] 1.5 [DL + LL] | 3353.9342 | 147.7759 | 520.9787 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3114.717 | 483.6584 | -12.2132 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3353.9342 | 520.9787 | -12.2951 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.219 | 201] 1.5 [DL + LL] | 3698.1084 | -137.6067 | 465.8383 |
| Bottom | 0.234 | 201] 1.5 [DL + LL] | 3937.1392 | 150.3683 | 452.1455 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3698.1084 | 465.8383 | -28.2998 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3937.1392 | 452.1455 | -28.3617 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.236 | 201] 1.5 [DL + LL] | 4278.2498 | -133.7033 | 411.4775 |
| Bottom | 0.253 | 201] 1.5 [DL + LL] | 4517.1926 | 150.2938 | 364.47 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4278.2498 | 411.4775 | -38.8324 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4517.1926 | 364.47 | -38.8726 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.256 | 201] 1.5 [DL + LL] | 4868.2914 | -132.1263 | 280.2602 |
| Bottom | 0.275 | 201] 1.5 [DL + LL] | 5107.0623 | 152.1383 | 393.4585 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4868.2914 | 280.2602 | 12.1241 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5107.0623 | 393.4585 | 12.1039 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.28 | 201] 1.5 [DL + LL] | 5463.0113 | -130.9328 | 293.3679 |
| Bottom | 0.296 | 201] 1.5 [DL + LL] | 5701.7185 | 146.8429 | 311.8372 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5463.0113 | 293.3679 | -17.8992 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5701.7185 | 311.8372 | -17.9188 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.304 | 201] 1.5 [DL + LL] | 6054.0023 | -132.8938 | 224.6458 |
| Bottom | 0.319 | 201] 1.5 [DL + LL] | 6292.7714 | 145.4363 | 249.1608 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6054.0023 | 224.6458 | -16.027 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6292.7714 | 249.1608 | -16.0472 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.326 | 201] 1.5 [DL + LL] | 6642.5578 | -130.1911 | 169.0305 |
| Bottom | 0.342 | 201] 1.5 [DL + LL] | 6881.4411 | 144.1883 | 202.639 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6642.5578 | 169.0305 | -13.2287 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6881.4411 | 202.639 | -13.2461 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.347 | 201] 1.5 [DL + LL] | 7228.6487 | -126.5319 | 128.4787 |
| Bottom | 0.364 | 201] 1.5 [DL + LL] | 7467.6669 | 142.3384 | 169.6893 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7228.6487 | 128.4787 | -10.9204 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7467.6669 | 169.6893 | -10.9348 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.369 | 201] 1.5 [DL + LL] | 7812.3496 | -122.8574 | 100.2026 |
| Bottom | 0.387 | 201] 1.5 [DL + LL] | 8051.5103 | 140.0096 | 145.6851 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7812.3496 | 100.2026 | -9.675 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8051.5103 | 145.6851 | -9.6871 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.394 | 201] 1.5 [DL + LL] | 8393.6506 | -119.0507 | 79.874 |
| Bottom | 0.409 | 201] 1.5 [DL + LL] | 8632.9516 | 137.274 | 126.9922 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8393.6506 | 79.874 | -9.2645 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8632.9516 | 126.9922 | -9.2749 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.418 | 201] 1.5 [DL + LL] | 8972.4965 | -115.0248 | 64.0144 |
| Bottom | 0.433 | 201] 1.5 [DL + LL] | 9211.9291 | 134.1007 | 112.2989 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8972.4965 | 64.0144 | -8.9961 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9211.9291 | 112.2989 | -9.0054 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.443 | 201] 1.5 [DL + LL] | 9548.802 | -110.7947 | 51.404 |
| Bottom | 0.458 | 201] 1.5 [DL + LL] | 9788.3517 | 130.5528 | 103.8656 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9548.802 | 51.404 | -7.7608 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9788.3517 | 103.8656 | -7.7693 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.467 | 201] 1.5 [DL + LL] | 10122.482 | -106.3292 | 44.3469 |
| Bottom | 0.482 | 201] 1.5 [DL + LL] | 10362.1262 | 126.602 | 111.4542 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10122.482 | 44.3469 | -3.1848 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10362.1262 | 111.4542 | -3.1927 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.491 | 201] 1.5 [DL + LL] | 10693.3391 | -101.4814 | 52.8891 |
| Bottom | 0.507 | 201] 1.5 [DL + LL] | 10933.0572 | 118.5072 | 129.828 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10693.3391 | 52.8891 | -0.1161 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10933.0572 | 129.828 | -0.1228 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.517 | 201] 1.5 [DL + LL] | 11260.7185 | -99.5824 | 72.3712 |
| Bottom | 0.531 | 201] 1.5 [DL + LL] | 11500.4607 | 114.7205 | 122.2842 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11260.7185 | 72.3712 | -8.6989 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11500.4607 | 122.2842 | -8.704 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 201] 1.5 [DL + LL] | 11827.7361 | -98.7625 | 64.7293 |
| Bottom | 0.558 | 201] 1.5 [DL + LL] | 12067.408 | 124.8069 | 122.6329 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11827.7361 | 64.7293 | -6.0954 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12067.408 | 122.6329 | -6.1029 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.563 | 201] 1.5 [DL + LL] | 12392.5362 | -79.2438 | 57.0573 |
| Bottom | 0.581 | 201] 1.5 [DL + LL] | 12632.5529 | 115.7319 | 125.2513 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12392.5362 | 57.0573 | -3.0658 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12632.5529 | 125.2513 | -3.0743 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.591 | 201] 1.5 [DL + LL] | 12957.8714 | -81.399 | 50.8569 |
| Bottom | 0.605 | 201] 1.5 [DL + LL] | 13198.0228 | 111.0107 | 156.5922 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12957.8714 | 50.8569 | 8.7672 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13198.0228 | 156.5922 | 8.764 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 201] 1.5 [DL + LL] | 13523.8257 | -79.9167 | 72.3278 |
| Bottom | 0.63 | 201] 1.5 [DL + LL] | 13764.0971 | 107.7751 | 169.2786 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13523.8257 | 72.3278 | 5.9244 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13764.0971 | 169.2786 | 5.9222 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.64 | 201] 1.5 [DL + LL] | 14090.154 | -76.1114 | 75.0438 |
| Bottom | 0.655 | 201] 1.5 [DL + LL] | 14330.539 | 104.5198 | 158.7941 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14090.154 | 75.0438 | 1.6935 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14330.539 | 158.7941 | 1.691 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.665 | 201] 1.5 [DL + LL] | 14656.9523 | -71.8254 | 53.5678 |
| Bottom | 0.68 | 201] 1.5 [DL + LL] | 14897.4385 | 101.0367 | 118.3089 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14656.9523 | 53.5678 | -4.3727 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14897.4385 | 118.3089 | -4.3757 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.68 | 201] 1.5 [DL + LL] | 15224.4591 | -67.2678 | 0.4436 |
| Bottom | 0.694 | 201] 1.5 [DL + LL] | 15465.035 | 96.6398 | 32.1514 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15224.4591 | 0.4436 | -14.8951 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15465.035 | 32.1514 | -14.8989 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.704 | 201] 1.5 [DL + LL] | 15793.1756 | -63.1054 | -101.146 |
| Bottom | 0.718 | 201] 1.5 [DL + LL] | 16033.8646 | 89.339 | -100.4203 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15793.1756 | -101.146 | -24.8217 | 3781.9147 | 4794.3704 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16033.8646 | -100.4203 | -24.8226 | 3781.9147 | 4794.3704 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.728 | 201] 1.5 [DL + LL] | 16355.1417 | -63.7959 | -240.6838 |
| Bottom | 0.741 | 201] 1.5 [DL + LL] | 16602.324 | 74.0663 | -178.4377 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16355.1417 | -240.6838 | -5.1818 | 3755.624 | 4768.0797 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16602.324 | -178.4377 | -5.1919 | 3755.624 | 4768.0797 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.868 | 201] 1.5 [DL + LL] | 17078.4145 | -479.2807 | 207.6759 |
| Bottom | 0.882 | 201] 1.5 [DL + LL] | 17388.266 | 488.3903 | -56.8517 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17078.4145 | 207.6759 | -82.0165 | 3505.8625 | 4518.3182 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17388.266 | -56.8517 | -82.0173 | 3505.8625 | 4518.3182 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.889 | 201] 1.5 [DL + LL] | 17808.8818 | -450.4438 | 456.2398 |
| Bottom | 0.909 | 201] 1.5 [DL + LL] | 18106.9678 | 458.4725 | 765.6646 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17808.8818 | 456.2398 | 57.1317 | 3553.1858 | 4565.6414 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18106.9678 | 765.6646 | 57.1423 | 3553.1858 | 4565.6414 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.585 | 201] 1.5 [DL + LL] | 1844.2954 | -72.2497 | -304.2027 |
| Bottom | 0.487 | 201] 1.5 [DL + LL] | 1890.3506 | 68.0151 | -12.3733 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1844.2954 | -304.2027 | 92.5741 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1890.3506 | -12.3733 | 92.5741 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.533 | 201] 1.5 [DL + LL] | 2074.1808 | -62.9716 | 101.0025 |
| Bottom | 0.533 | 201] 1.5 [DL + LL] | 2120.2359 | 63.739 | -59.83 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2074.1808 | 101.0025 | -51.2253 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2120.2359 | -59.83 | -51.2253 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.567 | 201] 1.5 [DL + LL] | 2310.9879 | -64.7319 | 54.4349 |
| Bottom | 0.574 | 201] 1.5 [DL + LL] | 2357.0431 | 64.3212 | -54.0845 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2310.9879 | 54.4349 | -34.6092 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2357.0431 | -54.0845 | -34.6092 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.612 | 201] 1.5 [DL + LL] | 2552.4224 | -63.7905 | 57.412 |
| Bottom | 0.62 | 201] 1.5 [DL + LL] | 2598.4775 | 63.6347 | -52.8378 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2552.4224 | 57.412 | -35.1659 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2598.4775 | -52.8378 | -35.1659 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.626 | 201] 1.5 [DL + LL] | 2799.2569 | -63.0403 | 55.9479 |
| Bottom | 0.633 | 201] 1.5 [DL + LL] | 2845.312 | 62.8101 | -51.8143 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2799.2569 | 55.9479 | -34.3789 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2845.312 | -51.8143 | -34.3789 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 201] 1.5 [DL + LL] | 3051.802 | -62.0539 | 54.1528 |
| Bottom | 0.678 | 201] 1.5 [DL + LL] | 3097.8571 | 61.7758 | -50.579 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3051.802 | 54.1528 | -33.4197 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3097.8571 | -50.579 | -33.4197 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.716 | 201] 1.5 [DL + LL] | 3310.5295 | -60.897 | 52.3193 |
| Bottom | 0.724 | 201] 1.5 [DL + LL] | 3356.5847 | 60.5681 | -49.133 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3310.5295 | 52.3193 | -32.3818 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3356.5847 | -49.133 | -32.3818 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.763 | 201] 1.5 [DL + LL] | 3575.9324 | -59.561 | 50.4655 |
| Bottom | 0.77 | 201] 1.5 [DL + LL] | 3621.9876 | 59.179 | -47.5487 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3575.9324 | 50.4655 | -31.2938 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3621.9876 | -47.5487 | -31.2938 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.81 | 201] 1.5 [DL + LL] | 3848.5596 | -58.0947 | 48.5046 |
| Bottom | 0.819 | 201] 1.5 [DL + LL] | 3894.6147 | 57.6568 | -45.6141 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3848.5596 | 48.5046 | -30.0604 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3894.6147 | -45.6141 | -30.0604 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.866 | 201] 1.5 [DL + LL] | 4129.017 | -56.5042 | 46.6573 |
| Bottom | 0.875 | 201] 1.5 [DL + LL] | 4175.0722 | 56.1013 | -40.8439 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4129.017 | 46.6573 | -27.9574 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4175.0722 | -40.8439 | -27.9574 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.922 | 201] 1.5 [DL + LL] | 4417.7796 | -54.3185 | 47.834 |
| Bottom | 0.929 | 201] 1.5 [DL + LL] | 4463.8348 | 54.113 | -85.7639 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4417.7796 | 47.834 | -42.6377 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4463.8348 | -85.7639 | -42.6377 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.985 | 201] 1.5 [DL + LL] | 4716.4497 | -51.821 | -7.4815 |
| Bottom | 0.995 | 201] 1.5 [DL + LL] | 4762.5049 | 49.5811 | 218.0752 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4716.4497 | -7.4815 | 71.4494 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4762.5049 | 218.0752 | 71.4494 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.821 | 201] 1.5 [DL + LL] | 5019.2355 | -69.5828 | -647.4118 |
| Bottom | 0.782 | 201] 1.5 [DL + LL] | 5079.4614 | 66.0319 | 39.7317 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5019.2355 | -647.4118 | 218.0998 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5079.4614 | 39.7317 | 218.0998 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.814 | 201] 1.5 [DL + LL] | 5335.7044 | -57.2251 | 83.9391 |
| Bottom | 0.826 | 201] 1.5 [DL + LL] | 5395.9304 | 58.3447 | -7.9406 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5335.7044 | 83.9391 | -29.431 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5395.9304 | -7.9406 | -29.431 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.865 | 201] 1.5 [DL + LL] | 5660.8966 | -59.1662 | 31.9451 |
| Bottom | 0.874 | 201] 1.5 [DL + LL] | 5721.1225 | 58.419 | -16.3026 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5660.8966 | 31.9451 | -15.4844 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5721.1225 | -16.3026 | -15.4844 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.914 | 201] 1.5 [DL + LL] | 5996.0457 | -57.6894 | 14.8116 |
| Bottom | 0.923 | 201] 1.5 [DL + LL] | 6056.2716 | 57.2661 | -9.0159 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5996.0457 | 14.8116 | -7.7238 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6056.2716 | -9.0159 | -7.7238 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.965 | 201] 1.5 [DL + LL] | 6341.8504 | -56.2386 | 12.017 |
| Bottom | 0.974 | 201] 1.5 [DL + LL] | 6402.0764 | 55.8526 | -3.4085 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6341.8504 | 12.017 | -5.0451 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6402.0764 | -3.4085 | -5.0451 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.018 | 201] 1.5 [DL + LL] | 6699.1401 | -54.7734 | 7.2499 |
| Bottom | 1.026 | 201] 1.5 [DL + LL] | 6759.3661 | 54.3207 | 2.5971 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6699.1401 | 7.2499 | -1.6065 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6759.3661 | 2.5971 | -1.6065 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.072 | 201] 1.5 [DL + LL] | 7068.9527 | -53.4856 | 2.3549 |
| Bottom | 1.08 | 201] 1.5 [DL + LL] | 7129.1787 | 53.3701 | 10.7913 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7068.9527 | 2.3549 | 2.577 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7129.1787 | 10.7913 | 2.577 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.127 | 201] 1.5 [DL + LL] | 7452.523 | -50.8388 | -0.8559 |
| Bottom | 1.135 | 201] 1.5 [DL + LL] | 7512.749 | 49.3934 | 10.9533 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7452.523 | -0.8559 | 3.6898 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7512.749 | 10.9533 | 3.6898 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.187 | 201] 1.5 [DL + LL] | 7850.3294 | -53.3623 | -13.0235 |
| Bottom | 1.199 | 201] 1.5 [DL + LL] | 7912.4673 | 59.6434 | 16.2744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7850.3294 | -13.0235 | 8.9663 | 321.1492 | 615.6187 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7912.4673 | 16.2744 | 8.9663 | 321.1492 | 615.6187 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.355 | 201] 1.5 [DL + LL] | 8294.8084 | -225.1736 | -22.9217 |
| Bottom | 1.369 | 201] 1.5 [DL + LL] | 8375.1097 | 227.5345 | 28.3344 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8294.8084 | -22.9217 | 12.1467 | 237.326 | 531.7956 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8375.1097 | 28.3344 | 12.1467 | 237.326 | 531.7956 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.435 | 201] 1.5 [DL + LL] | 8869.8948 | -228.3643 | -38.8082 |
| Bottom | 1.447 | 201] 1.5 [DL + LL] | 8946.7546 | 230.4344 | 34.9329 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8869.8948 | -38.8082 | 18.2593 | 247.937 | 542.4066 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8946.7546 | 34.9329 | 18.2593 | 247.937 | 542.4066 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.492 | 201] 1.5 [DL + LL] | 1322.3754 | 79.6115 | -164.5825 |
| Bottom | 0.404 | 201] 1.5 [DL + LL] | 1364.8878 | -69.6522 | -17.0761 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1322.3754 | -164.5825 | 46.8313 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1364.8878 | -17.0761 | 46.8313 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.427 | 201] 1.5 [DL + LL] | 1579.0429 | 63.8036 | 18.7579 |
| Bottom | 0.436 | 201] 1.5 [DL + LL] | 1621.5554 | -65.064 | -14.4926 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1579.0429 | 18.7579 | -10.668 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1621.5554 | -14.4926 | -10.668 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.475 | 201] 1.5 [DL + LL] | 1835.0822 | 65.2471 | 22.2343 |
| Bottom | 0.479 | 201] 1.5 [DL + LL] | 1877.5946 | -64.6672 | -17.6318 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1835.0822 | 22.2343 | -12.7704 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1877.5946 | -17.6318 | -12.7704 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.518 | 201] 1.5 [DL + LL] | 2090.1838 | 64.2276 | 19.2227 |
| Bottom | 0.525 | 201] 1.5 [DL + LL] | 2132.6962 | -63.8013 | -16.6233 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2090.1838 | 19.2227 | -11.5019 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2132.6962 | -16.6233 | -11.5019 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.566 | 201] 1.5 [DL + LL] | 2344.4548 | 63.7288 | 20.2643 |
| Bottom | 0.573 | 201] 1.5 [DL + LL] | 2386.9672 | -63.2045 | -16.9156 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2344.4548 | 20.2643 | -11.9296 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2386.9672 | -16.9156 | -11.9296 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.613 | 201] 1.5 [DL + LL] | 2597.9191 | 63.1304 | 20.0028 |
| Bottom | 0.62 | 201] 1.5 [DL + LL] | 2640.4316 | -62.5969 | -17.2058 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2597.9191 | 20.0028 | -11.9416 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2640.4316 | -17.2058 | -11.9416 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.627 | 201] 1.5 [DL + LL] | 2850.518 | 62.5813 | 19.6192 |
| Bottom | 0.633 | 201] 1.5 [DL + LL] | 2893.0304 | -62.0166 | -17.2736 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2850.518 | 19.6192 | -11.8448 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2893.0304 | -17.2736 | -11.8448 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 201] 1.5 [DL + LL] | 3102.1876 | 62.0379 | 19.3416 |
| Bottom | 0.677 | 201] 1.5 [DL + LL] | 3144.7 | -61.4461 | -16.9627 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3102.1876 | 19.3416 | -11.6612 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3144.7 | -16.9627 | -11.6612 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.735 | 201] 1.5 [DL + LL] | 3352.8612 | 61.4712 | 19.3717 |
| Bottom | 0.74 | 201] 1.5 [DL + LL] | 3395.3736 | -60.9008 | -15.3056 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3352.8612 | 19.3717 | -11.1435 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3395.3736 | -15.3056 | -11.1435 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.782 | 201] 1.5 [DL + LL] | 3602.4754 | 60.7513 | 20.828 |
| Bottom | 0.79 | 201] 1.5 [DL + LL] | 3644.9878 | -59.8512 | -24.3189 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3602.4754 | 20.828 | -14.467 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3644.9878 | -24.3189 | -14.467 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.816 | 201] 1.5 [DL + LL] | 3850.9289 | 60.9794 | 10.9241 |
| Bottom | 0.824 | 201] 1.5 [DL + LL] | 3893.4413 | -59.9174 | -56.1347 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3850.9289 | 10.9241 | -21.5537 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3893.4413 | -56.1347 | -21.5537 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 201] 1.5 [DL + LL] | 4095.8814 | 60.1044 | -27.1416 |
| Bottom | 0.89 | 201] 1.5 [DL + LL] | 4138.3938 | -60.9036 | 250.8129 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4095.8814 | -27.1416 | 88.0945 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4138.3938 | 250.8129 | 88.0945 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.792 | 201] 1.5 [DL + LL] | 4362.7255 | 99.156 | -727.27 |
| Bottom | 0.709 | 201] 1.5 [DL + LL] | 4422.9515 | -90.1657 | -46.218 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4362.7255 | -727.27 | 216.4052 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4422.9515 | -46.218 | 216.4052 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.733 | 201] 1.5 [DL + LL] | 4636.8697 | 91.2593 | -16.2964 |
| Bottom | 0.743 | 201] 1.5 [DL + LL] | 4697.0957 | -89.9651 | 33.6023 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4636.8697 | -16.2964 | 15.4952 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4697.0957 | 33.6023 | 15.4952 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.775 | 201] 1.5 [DL + LL] | 4911.1595 | 88.099 | 66.4362 |
| Bottom | 0.777 | 201] 1.5 [DL + LL] | 4971.3855 | -87.0622 | -8.3514 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4911.1595 | 66.4362 | -23.9314 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4971.3855 | -8.3514 | -23.9314 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.807 | 201] 1.5 [DL + LL] | 5184.4207 | 85.8478 | 28.2739 |
| Bottom | 0.816 | 201] 1.5 [DL + LL] | 5244.6466 | -84.3535 | -17.7242 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5184.4207 | 28.2739 | -14.7297 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5244.6466 | -17.7242 | -14.7297 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 201] 1.5 [DL + LL] | 5455.8945 | 83.6805 | 20.4533 |
| Bottom | 0.855 | 201] 1.5 [DL + LL] | 5516.1205 | -81.9523 | -15.9731 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5455.8945 | 20.4533 | -11.6871 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5516.1205 | -15.9731 | -11.6871 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.885 | 201] 1.5 [DL + LL] | 5725.4682 | 81.0251 | 23.7236 |
| Bottom | 0.894 | 201] 1.5 [DL + LL] | 5785.6942 | -79.157 | -14.8851 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5725.4682 | 23.7236 | -12.3691 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5785.6942 | -14.8851 | -12.3691 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.923 | 201] 1.5 [DL + LL] | 5993.0774 | 78.3188 | 26.764 |
| Bottom | 0.932 | 201] 1.5 [DL + LL] | 6053.3033 | -76.5528 | -17.19 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5993.0774 | 26.764 | -14.0431 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6053.3033 | -17.19 | -14.0431 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.961 | 201] 1.5 [DL + LL] | 6258.6042 | 74.6826 | 26.6684 |
| Bottom | 0.969 | 201] 1.5 [DL + LL] | 6318.8302 | -70.7929 | -11.979 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6258.6042 | 26.6684 | -12.3319 | 336.3621 | 630.8317 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6318.8302 | -11.979 | -12.3319 | 336.3621 | 630.8317 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1 | 201] 1.5 [DL + LL] | 6522.2278 | 76.0738 | 34.3488 |
| Bottom | 1.012 | 201] 1.5 [DL + LL] | 6584.3657 | -85.5279 | 84.6688 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6522.2278 | 34.3488 | 15.5915 | 321.1492 | 615.6187 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6584.3657 | 84.6688 | 15.5915 | 321.1492 | 615.6187 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.172 | 201] 1.5 [DL + LL] | 7002.5104 | 175.0277 | -163.5317 |
| Bottom | 1.184 | 201] 1.5 [DL + LL] | 7082.8117 | -177.3885 | 143.5633 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7002.5104 | -163.5317 | 73.1668 | 237.326 | 531.7956 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7082.8117 | 143.5633 | 73.1668 | 237.326 | 531.7956 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.296 | 201] 1.5 [DL + LL] | 7504.7065 | 223.88 | -115.2598 |
| Bottom | 1.302 | 201] 1.5 [DL + LL] | 7581.5663 | -225.9501 | 57.0781 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7504.7065 | -115.2598 | 42.8594 | 247.937 | 542.4066 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7581.5663 | 57.0781 | 42.8594 | 247.937 | 542.4066 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.534 | 201] 1.5 [DL + LL] | 1384.303 | -78.2078 | -241.8499 |
| Bottom | 0.419 | 201] 1.5 [DL + LL] | 1426.8155 | 68.0673 | 46.4298 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1384.303 | -241.8499 | 91.4446 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1426.8155 | 46.4298 | 91.4446 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.426 | 201] 1.5 [DL + LL] | 1651.751 | -60.0541 | -6.9498 |
| Bottom | 0.445 | 201] 1.5 [DL + LL] | 1694.2634 | 62.085 | 25.7721 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1651.751 | -6.9498 | 10.2195 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1694.2634 | 25.7721 | 10.2195 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.486 | 201] 1.5 [DL + LL] | 1916.7052 | -63.2105 | -26.6486 |
| Bottom | 0.493 | 201] 1.5 [DL + LL] | 1959.2176 | 63.0258 | 28.7646 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1916.7052 | -26.6486 | 17.4148 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1959.2176 | 28.7646 | 17.4148 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.534 | 201] 1.5 [DL + LL] | 2181.4931 | -62.9868 | -24.1687 |
| Bottom | 0.543 | 201] 1.5 [DL + LL] | 2224.0056 | 63.1059 | 28.7533 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2181.4931 | -24.1687 | 16.6129 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2224.0056 | 28.7533 | 16.6129 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.575 | 201] 1.5 [DL + LL] | 2446.3944 | -63.5475 | -24.1113 |
| Bottom | 0.583 | 201] 1.5 [DL + LL] | 2488.9068 | 63.6161 | 28.1589 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2446.3944 | -24.1113 | 16.4003 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2488.9068 | 28.1589 | 16.4003 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.625 | 201] 1.5 [DL + LL] | 2711.6338 | -64.0516 | -24.5507 |
| Bottom | 0.634 | 201] 1.5 [DL + LL] | 2754.1463 | 64.1865 | 27.7364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2711.6338 | -24.5507 | 16.4001 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2754.1463 | 27.7364 | 16.4001 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.672 | 201] 1.5 [DL + LL] | 2977.4281 | -64.71 | -24.8069 |
| Bottom | 0.681 | 201] 1.5 [DL + LL] | 3019.9406 | 64.8821 | 27.5506 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2977.4281 | -24.8069 | 16.4168 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3019.9406 | 27.5506 | 16.4168 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.723 | 201] 1.5 [DL + LL] | 3244.0133 | -65.4998 | -24.736 |
| Bottom | 0.732 | 201] 1.5 [DL + LL] | 3286.5258 | 65.6946 | 27.6386 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3244.0133 | -24.736 | 16.4182 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3286.5258 | 27.6386 | 16.4182 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 201] 1.5 [DL + LL] | 3511.6402 | -66.4526 | -24.178 |
| Bottom | 0.764 | 201] 1.5 [DL + LL] | 3554.1526 | 66.7294 | 27.7621 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3511.6402 | -24.178 | 16.2813 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3554.1526 | 27.7621 | 16.2813 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.804 | 201] 1.5 [DL + LL] | 3780.5003 | -67.384 | -23.2387 |
| Bottom | 0.813 | 201] 1.5 [DL + LL] | 3823.0127 | 67.3088 | 27.7716 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3780.5003 | -23.2387 | 15.9952 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3823.0127 | 27.7716 | 15.9952 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.861 | 201] 1.5 [DL + LL] | 4051.101 | -69.5955 | -22.3537 |
| Bottom | 0.87 | 201] 1.5 [DL + LL] | 4093.6134 | 70.7923 | -19.9993 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4051.101 | -22.3537 | 0.4786 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4093.6134 | -19.9993 | 0.4786 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.92 | 201] 1.5 [DL + LL] | 4325.6002 | -67.9034 | -76.467 |
| Bottom | 0.942 | 201] 1.5 [DL + LL] | 4368.1126 | 63.9505 | 285.7488 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4325.6002 | -76.467 | 114.7923 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4368.1126 | 285.7488 | 114.7923 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.801 | 201] 1.5 [DL + LL] | 4557.2107 | -72.2361 | -1080.573 |
| Bottom | 0.679 | 201] 1.5 [DL + LL] | 4620.9794 | 68.0048 | 81.0353 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4557.2107 | -1080.573 | 368.8962 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4620.9794 | 81.0353 | 368.8962 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.707 | 201] 1.5 [DL + LL] | 4816.0219 | -68.9105 | -29.0226 |
| Bottom | 0.714 | 201] 1.5 [DL + LL] | 4879.7905 | 67.9535 | 85.4993 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4816.0219 | -29.0226 | 36.0636 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4879.7905 | 85.4993 | 36.0636 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.743 | 201] 1.5 [DL + LL] | 5073.7465 | -66.8044 | -16.2453 |
| Bottom | 0.75 | 201] 1.5 [DL + LL] | 5137.5152 | 66.4487 | 52.1266 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5073.7465 | -16.2453 | 21.5318 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5137.5152 | 52.1266 | 21.5318 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.777 | 201] 1.5 [DL + LL] | 5330.2458 | -65.2971 | -42.7572 |
| Bottom | 0.786 | 201] 1.5 [DL + LL] | 5394.0144 | 64.8309 | 47.4786 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5330.2458 | -42.7572 | 28.4999 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5394.0144 | 47.4786 | 28.4999 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.813 | 201] 1.5 [DL + LL] | 5586.3081 | -64.1155 | -42.9402 |
| Bottom | 0.821 | 201] 1.5 [DL + LL] | 5650.0768 | 63.4242 | 47.7404 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5586.3081 | -42.9402 | 28.6455 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5650.0768 | 47.7404 | 28.6455 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.848 | 201] 1.5 [DL + LL] | 5841.9445 | -62.8274 | -38.0331 |
| Bottom | 0.856 | 201] 1.5 [DL + LL] | 5905.7131 | 62.167 | 47.9559 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5841.9445 | -38.0331 | 27.1719 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5905.7131 | 47.9559 | 27.1719 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.883 | 201] 1.5 [DL + LL] | 6097.0659 | -61.2134 | -32.3865 |
| Bottom | 0.891 | 201] 1.5 [DL + LL] | 6160.8345 | 59.8571 | 48.0216 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6097.0659 | -32.3865 | 25.4337 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6160.8345 | 48.0216 | 25.4337 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.919 | 201] 1.5 [DL + LL] | 6351.9117 | -61.1972 | -26.1193 |
| Bottom | 0.928 | 201] 1.5 [DL + LL] | 6415.6803 | 61.904 | 45.4711 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6351.9117 | -26.1193 | 22.6871 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6415.6803 | 45.4711 | 22.6871 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.952 | 201] 1.5 [DL + LL] | 6605.6186 | -54.5033 | -22.0878 |
| Bottom | 0.958 | 201] 1.5 [DL + LL] | 6671.4117 | 46.6421 | 22.6818 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6605.6186 | -22.0878 | 13.7828 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6671.4117 | 22.6818 | 13.7828 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.141 | 201] 1.5 [DL + LL] | 6861.2623 | -245.5226 | -37.8377 |
| Bottom | 1.154 | 201] 1.5 [DL + LL] | 6946.2872 | 248.0224 | 37.3994 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6861.2623 | -37.8377 | 17.8899 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6946.2872 | 37.3994 | 17.8899 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.101 | 201] 1.5 [DL + LL] | 7390.6625 | -156.8438 | -55.5487 |
| Bottom | 1.112 | 201] 1.5 [DL + LL] | 7472.0434 | 159.0357 | 45.5123 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7390.6625 | -55.5487 | 25.068 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7472.0434 | 45.5123 | 25.068 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.516 | 201] 1.5 [DL + LL] | 1366.2888 | 74.9209 | -236.1965 |
| Bottom | 0.408 | 201] 1.5 [DL + LL] | 1408.8012 | -65.4937 | 40.2285 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1366.2888 | -236.1965 | 87.7497 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1408.8012 | 40.2285 | 87.7497 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.417 | 201] 1.5 [DL + LL] | 1631.9116 | 57.6409 | -8.6884 |
| Bottom | 0.434 | 201] 1.5 [DL + LL] | 1674.4241 | -59.6374 | 22.0177 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1631.9116 | -8.6884 | 9.6499 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1674.4241 | 22.0177 | 9.6499 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.476 | 201] 1.5 [DL + LL] | 1895.0042 | 60.5388 | -26.9084 |
| Bottom | 0.483 | 201] 1.5 [DL + LL] | 1937.5166 | -60.3735 | 26.1705 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1895.0042 | -26.9084 | 16.7427 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1937.5166 | 26.1705 | 16.7427 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.525 | 201] 1.5 [DL + LL] | 2157.8515 | 60.3884 | -23.7622 |
| Bottom | 0.534 | 201] 1.5 [DL + LL] | 2200.364 | -60.4365 | 26.7061 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2157.8515 | -23.7622 | 15.9047 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2200.364 | 26.7061 | 15.9047 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.565 | 201] 1.5 [DL + LL] | 2420.7975 | 60.9869 | -23.3905 |
| Bottom | 0.574 | 201] 1.5 [DL + LL] | 2463.31 | -60.9597 | 26.3516 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2420.7975 | -23.3905 | 15.6718 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2463.31 | 26.3516 | 15.6718 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 201] 1.5 [DL + LL] | 2684.0967 | 61.5559 | -23.7136 |
| Bottom | 0.624 | 201] 1.5 [DL + LL] | 2726.6091 | -61.5774 | 25.997 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2684.0967 | -23.7136 | 15.6599 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2726.6091 | 25.997 | 15.6599 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.662 | 201] 1.5 [DL + LL] | 2947.9866 | 62.2878 | -23.9927 |
| Bottom | 0.671 | 201] 1.5 [DL + LL] | 2990.499 | -62.3395 | 25.7848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2947.9866 | -23.9927 | 15.6787 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2990.499 | 25.7848 | 15.6787 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.713 | 201] 1.5 [DL + LL] | 3212.7191 | 63.1601 | -24.0529 |
| Bottom | 0.722 | 201] 1.5 [DL + LL] | 3255.2316 | -63.237 | 25.7732 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3212.7191 | -24.0529 | 15.6919 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3255.2316 | 25.7732 | 15.6919 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.744 | 201] 1.5 [DL + LL] | 3478.5563 | 64.191 | -23.7477 |
| Bottom | 0.753 | 201] 1.5 [DL + LL] | 3521.0687 | -64.3498 | 25.6985 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3478.5563 | -23.7477 | 15.5714 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3521.0687 | 25.6985 | 15.5714 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.796 | 201] 1.5 [DL + LL] | 3745.6982 | 65.2205 | -23.2544 |
| Bottom | 0.804 | 201] 1.5 [DL + LL] | 3788.2107 | -65.0963 | 25.5279 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3745.6982 | -23.2544 | 15.3641 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3788.2107 | 25.5279 | 15.3641 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.852 | 201] 1.5 [DL + LL] | 4014.6565 | 67.3932 | -22.9159 |
| Bottom | 0.861 | 201] 1.5 [DL + LL] | 4057.1689 | -68.3657 | -22.9184 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4014.6565 | -22.9159 | -0.2051 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4057.1689 | -22.9184 | -0.2051 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 201] 1.5 [DL + LL] | 4287.4975 | 66.2076 | -78.4069 |
| Bottom | 0.933 | 201] 1.5 [DL + LL] | 4330.0099 | -63.0959 | 280.8039 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4287.4975 | -78.4069 | 113.8729 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4330.0099 | 280.8039 | 113.8729 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.795 | 201] 1.5 [DL + LL] | 4518.6816 | 71.2072 | -1076.2739 |
| Bottom | 0.674 | 201] 1.5 [DL + LL] | 4582.4503 | -66.6907 | 87.6918 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4518.6816 | -1076.2739 | 369.6444 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4582.4503 | 87.6918 | 369.6444 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.701 | 201] 1.5 [DL + LL] | 4776.6679 | 68.3191 | -24.8881 |
| Bottom | 0.708 | 201] 1.5 [DL + LL] | 4840.4366 | -66.8664 | 88.337 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4776.6679 | -24.8881 | 35.6766 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4840.4366 | 88.337 | 35.6766 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 201] 1.5 [DL + LL] | 5033.7046 | 66.0459 | -14.8035 |
| Bottom | 0.744 | 201] 1.5 [DL + LL] | 5097.4733 | -65.3278 | 53.1889 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5033.7046 | -14.8035 | 21.4461 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5097.4733 | 53.1889 | 21.4461 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.771 | 201] 1.5 [DL + LL] | 5289.4945 | 64.4289 | -42.5265 |
| Bottom | 0.779 | 201] 1.5 [DL + LL] | 5353.2631 | -63.6353 | 47.6825 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5289.4945 | -42.5265 | 28.5307 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5353.2631 | 47.6825 | 28.5307 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.806 | 201] 1.5 [DL + LL] | 5544.7791 | 63.1654 | -43.255 |
| Bottom | 0.815 | 201] 1.5 [DL + LL] | 5608.5478 | -62.1787 | 47.3447 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5544.7791 | -43.255 | 28.6603 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5608.5478 | 47.3447 | 28.6603 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.842 | 201] 1.5 [DL + LL] | 5799.5419 | 61.7421 | -38.7486 |
| Bottom | 0.85 | 201] 1.5 [DL + LL] | 5863.3105 | -60.7428 | 47.0059 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5799.5419 | -38.7486 | 27.1362 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5863.3105 | 47.0059 | 27.1362 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 201] 1.5 [DL + LL] | 6053.6891 | 60.1528 | -33.5426 |
| Bottom | 0.885 | 201] 1.5 [DL + LL] | 6117.4578 | -58.7509 | 46.4793 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6053.6891 | -33.5426 | 25.3449 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6117.4578 | 46.4793 | 25.3449 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 201] 1.5 [DL + LL] | 6307.3638 | 59.378 | -27.8464 |
| Bottom | 0.92 | 201] 1.5 [DL + LL] | 6371.1324 | -58.6122 | 43.3907 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6307.3638 | -27.8464 | 22.6 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6371.1324 | 43.3907 | 22.6 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.946 | 201] 1.5 [DL + LL] | 6560.1734 | 55.7852 | -24.438 |
| Bottom | 0.955 | 201] 1.5 [DL + LL] | 6625.9665 | -53.371 | 22.4365 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6560.1734 | -24.438 | 14.4442 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6625.9665 | 22.4365 | 14.4442 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.045 | 201] 1.5 [DL + LL] | 6812.0823 | 171.6553 | -39.4289 |
| Bottom | 1.057 | 201] 1.5 [DL + LL] | 6897.1072 | -174.1551 | 28.6223 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6812.0823 | -39.4289 | 16.1741 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6897.1072 | 28.6223 | 16.1741 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.142 | 201] 1.5 [DL + LL] | 7147.0032 | 217.5915 | -39.6475 |
| Bottom | 1.154 | 201] 1.5 [DL + LL] | 7228.3842 | -219.7834 | 37.5849 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7147.0032 | -39.6475 | 19.1462 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7228.3842 | 37.5849 | 19.1462 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.417 | 201] 1.5 [DL + LL] | 1612.9883 | -33.4231 | 209.5758 |
| Bottom | 0.369 | 201] 1.5 [DL + LL] | 1655.5008 | 28.9502 | 5.4984 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1612.9883 | 209.5758 | -64.9539 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1655.5008 | 5.4984 | -64.9539 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.411 | 201] 1.5 [DL + LL] | 1831.4319 | -26.0624 | -77.5423 |
| Bottom | 0.419 | 201] 1.5 [DL + LL] | 1873.9444 | 27.5878 | 42.6105 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1831.4319 | -77.5423 | 38.0063 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1873.9444 | 42.6105 | 38.0063 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.455 | 201] 1.5 [DL + LL] | 2051.3675 | -27.8117 | -44.1066 |
| Bottom | 0.464 | 201] 1.5 [DL + LL] | 2093.8799 | 28.0881 | 46.37 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2051.3675 | -44.1066 | 28.5361 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2093.8799 | 46.37 | 28.5361 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.5 | 201] 1.5 [DL + LL] | 2272.3676 | -28.9513 | -40.7452 |
| Bottom | 0.51 | 201] 1.5 [DL + LL] | 2314.8801 | 28.9954 | 45.7148 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2272.3676 | -40.7452 | 27.2572 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2314.8801 | 45.7148 | 27.2572 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.546 | 201] 1.5 [DL + LL] | 2494.2484 | -29.8847 | -41.2184 |
| Bottom | 0.555 | 201] 1.5 [DL + LL] | 2536.7608 | 29.8711 | 45.0499 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2494.2484 | -41.2184 | 27.1958 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2536.7608 | 45.0499 | 27.1958 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.591 | 201] 1.5 [DL + LL] | 2716.7984 | -30.6402 | -41.5649 |
| Bottom | 0.6 | 201] 1.5 [DL + LL] | 2759.3108 | 30.6045 | 44.4942 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2716.7984 | -41.5649 | 27.1277 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2759.3108 | 44.4942 | 27.1277 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.61 | 201] 1.5 [DL + LL] | 2939.8009 | -31.2939 | -41.6677 |
| Bottom | 0.618 | 201] 1.5 [DL + LL] | 2982.3133 | 31.2184 | 44.1321 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2939.8009 | -41.6677 | 27.0432 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2982.3133 | 44.1321 | 27.0432 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.655 | 201] 1.5 [DL + LL] | 3163.0298 | -31.854 | -41.387 |
| Bottom | 0.664 | 201] 1.5 [DL + LL] | 3205.5423 | 31.6973 | 44.0509 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3163.0298 | -41.387 | 26.9275 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3205.5423 | 44.0509 | 26.9275 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.717 | 201] 1.5 [DL + LL] | 3386.2435 | -32.3874 | -40.5516 |
| Bottom | 0.726 | 201] 1.5 [DL + LL] | 3428.7559 | 32.2803 | 43.2084 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3386.2435 | -40.5516 | 26.3981 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3428.7559 | 43.2084 | 26.3981 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.763 | 201] 1.5 [DL + LL] | 3609.1525 | -32.5066 | -40.2143 |
| Bottom | 0.771 | 201] 1.5 [DL + LL] | 3651.6649 | 31.7179 | 40.5899 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3609.1525 | -40.2143 | 25.4603 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3651.6649 | 40.5899 | 25.4603 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.792 | 201] 1.5 [DL + LL] | 3831.7332 | -34.3083 | -41.4845 |
| Bottom | 0.797 | 201] 1.5 [DL + LL] | 3874.2456 | 34.5295 | 84.2005 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3831.7332 | -41.4845 | 39.7715 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3874.2456 | 84.2005 | 39.7715 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.839 | 201] 1.5 [DL + LL] | 4054.2003 | -32.429 | 6.1032 |
| Bottom | 0.848 | 201] 1.5 [DL + LL] | 4096.7127 | 30.713 | -217.6085 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4054.2003 | 6.1032 | -71.2629 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4096.7127 | -217.6085 | -71.2629 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 201] 1.5 [DL + LL] | 4276.6053 | -68.5579 | 911.5362 |
| Bottom | 0.637 | 201] 1.5 [DL + LL] | 4340.374 | 61.6698 | 34.2037 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4276.6053 | 911.5362 | -278.9502 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4340.374 | 34.2037 | -278.9502 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.667 | 201] 1.5 [DL + LL] | 4538.061 | -68.2957 | -69.5472 |
| Bottom | 0.676 | 201] 1.5 [DL + LL] | 4601.8296 | 66.4352 | 27.3494 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4538.061 | -69.5472 | 30.7148 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4601.8296 | 27.3494 | 30.7148 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.7 | 201] 1.5 [DL + LL] | 4797.5424 | -63.6083 | -73.7297 |
| Bottom | 0.71 | 201] 1.5 [DL + LL] | 4861.3111 | 63.7085 | 51.9777 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4797.5424 | -73.7297 | 39.776 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4861.3111 | 51.9777 | 39.776 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 201] 1.5 [DL + LL] | 5054.0063 | -63.2475 | -46.4325 |
| Bottom | 0.746 | 201] 1.5 [DL + LL] | 5117.7749 | 62.5807 | 50.5435 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5054.0063 | -46.4325 | 30.6468 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5117.7749 | 50.5435 | 30.6468 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.773 | 201] 1.5 [DL + LL] | 5308.0121 | -62.5018 | -44.5615 |
| Bottom | 0.781 | 201] 1.5 [DL + LL] | 5371.7808 | 61.6402 | 49.8929 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5308.0121 | -44.5615 | 29.8554 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5371.7808 | 49.8929 | 29.8554 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.808 | 201] 1.5 [DL + LL] | 5559.582 | -61.7135 | -41.793 |
| Bottom | 0.816 | 201] 1.5 [DL + LL] | 5623.3507 | 60.6744 | 51.1099 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5559.582 | -41.793 | 29.3798 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5623.3507 | 51.1099 | 29.3798 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 201] 1.5 [DL + LL] | 5808.5385 | -60.9952 | -36.8179 |
| Bottom | 0.851 | 201] 1.5 [DL + LL] | 5872.3072 | 59.8214 | 52.1685 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5808.5385 | -36.8179 | 28.1705 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5872.3072 | 52.1685 | 28.1705 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 201] 1.5 [DL + LL] | 6054.6331 | -60.0977 | -31.4827 |
| Bottom | 0.885 | 201] 1.5 [DL + LL] | 6118.4018 | 58.1587 | 45.6979 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6054.6331 | -31.4827 | 24.4725 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6118.4018 | 45.6979 | 24.4725 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 201] 1.5 [DL + LL] | 6297.7978 | -60.6026 | -33.9129 |
| Bottom | 0.923 | 201] 1.5 [DL + LL] | 6363.5909 | 64.1526 | 23.6728 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6297.7978 | -33.9129 | 17.7111 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6363.5909 | 23.6728 | 17.7111 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.076 | 201] 1.5 [DL + LL] | 6565.3648 | -221.8659 | -37.1984 |
| Bottom | 1.088 | 201] 1.5 [DL + LL] | 6650.3897 | 224.3656 | 22.3515 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6565.3648 | -37.1984 | 14.1231 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6650.3897 | 22.3515 | 14.1231 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 201] 1.5 [DL + LL] | 6928.7143 | -163.3515 | -64.6 |
| Bottom | 1.067 | 201] 1.5 [DL + LL] | 7010.0953 | 165.5434 | 72.4689 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6928.7143 | -64.6 | 33.9593 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7010.0953 | 72.4689 | 33.9593 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.436 | 201] 1.5 [DL + LL] | 964.1957 | -85.2974 | 55.0949 |
| Bottom | 0.377 | 201] 1.5 [DL + LL] | 1006.7081 | 72.3492 | 38.4036 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 964.1957 | 55.0949 | -5.2449 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1006.7081 | 38.4036 | -5.2449 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.393 | 201] 1.5 [DL + LL] | 1239.6822 | -62.6291 | -77.8903 |
| Bottom | 0.396 | 201] 1.5 [DL + LL] | 1282.1946 | 64.8151 | 53.7694 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1239.6822 | -77.8903 | 41.8691 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1282.1946 | 53.7694 | 41.8691 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.437 | 201] 1.5 [DL + LL] | 1512.7612 | -65.8376 | -64.1722 |
| Bottom | 0.443 | 201] 1.5 [DL + LL] | 1555.2736 | 65.5235 | 58.6558 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1512.7612 | -64.1722 | 39.0514 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1555.2736 | 58.6558 | 39.0514 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.481 | 201] 1.5 [DL + LL] | 1784.6302 | -64.6949 | -58.2226 |
| Bottom | 0.489 | 201] 1.5 [DL + LL] | 1827.1427 | 64.942 | 57.7811 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1784.6302 | -58.2226 | 36.8916 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1827.1427 | 57.7811 | 36.8916 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.522 | 201] 1.5 [DL + LL] | 2055.7951 | -64.6205 | -56.9616 |
| Bottom | 0.53 | 201] 1.5 [DL + LL] | 2098.3075 | 64.8265 | 56.2051 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2055.7951 | -56.9616 | 36.0018 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2098.3075 | 56.2051 | 36.0018 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.57 | 201] 1.5 [DL + LL] | 2326.8443 | -64.6551 | -56.2343 |
| Bottom | 0.577 | 201] 1.5 [DL + LL] | 2369.3567 | 64.9158 | 54.7284 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2326.8443 | -56.2343 | 35.311 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2369.3567 | 54.7284 | 35.311 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.607 | 201] 1.5 [DL + LL] | 2598.3406 | -64.9477 | -55.2862 |
| Bottom | 0.615 | 201] 1.5 [DL + LL] | 2640.8531 | 65.2646 | 53.453 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2598.3406 | -55.2862 | 34.6119 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2640.8531 | 53.453 | 34.6119 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.659 | 201] 1.5 [DL + LL] | 2870.8504 | -65.448 | -53.9558 |
| Bottom | 0.668 | 201] 1.5 [DL + LL] | 2913.3628 | 65.8246 | 52.1175 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2870.8504 | -53.9558 | 33.7717 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2913.3628 | 52.1175 | 33.7717 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.694 | 201] 1.5 [DL + LL] | 3144.9525 | -66.2124 | -52.4365 |
| Bottom | 0.702 | 201] 1.5 [DL + LL] | 3187.465 | 66.7536 | 50.4989 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3144.9525 | -52.4365 | 32.7814 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3187.465 | 50.4989 | 32.7814 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.746 | 201] 1.5 [DL + LL] | 3421.2069 | -66.953 | -51.0236 |
| Bottom | 0.754 | 201] 1.5 [DL + LL] | 3463.7193 | 67.172 | 51.3201 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3421.2069 | -51.0236 | 32.6022 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3463.7193 | 51.3201 | 32.6022 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.8 | 201] 1.5 [DL + LL] | 3700.4426 | -69.2444 | -46.3349 |
| Bottom | 0.818 | 201] 1.5 [DL + LL] | 3742.955 | 71.1012 | 87.8231 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3700.4426 | -46.3349 | 42.7979 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3742.955 | 87.8231 | 42.7979 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 201] 1.5 [DL + LL] | 3982.6613 | -66.5471 | -1.4764 |
| Bottom | 0.869 | 201] 1.5 [DL + LL] | 4025.1738 | 61.2972 | -230.4494 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3982.6613 | -1.4764 | -72.6215 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4025.1738 | -230.4494 | -72.6215 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.722 | 201] 1.5 [DL + LL] | 4246.5833 | -70.6549 | 888.3308 |
| Bottom | 0.634 | 201] 1.5 [DL + LL] | 4310.352 | 64.3845 | 71.6017 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4246.5833 | 888.3308 | -259.5776 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4310.352 | 71.6017 | -259.5776 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.664 | 201] 1.5 [DL + LL] | 4522.2081 | -63.2071 | 12.861 |
| Bottom | 0.673 | 201] 1.5 [DL + LL] | 4585.9767 | 63.5877 | -9.9367 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4522.2081 | 12.861 | -6.9867 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4585.9767 | -9.9367 | -6.9867 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.701 | 201] 1.5 [DL + LL] | 4801.5902 | -62.7142 | -63.3198 |
| Bottom | 0.712 | 201] 1.5 [DL + LL] | 4865.3588 | 62.728 | 12.3657 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4801.5902 | -63.3198 | 24.1923 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4865.3588 | 12.3657 | 24.1923 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.741 | 201] 1.5 [DL + LL] | 5083.4423 | -62.1684 | -40.1162 |
| Bottom | 0.751 | 201] 1.5 [DL + LL] | 5147.211 | 62.1968 | 19.5779 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5083.4423 | -40.1162 | 19.0558 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5147.211 | 19.5779 | 19.0558 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.781 | 201] 1.5 [DL + LL] | 5368.194 | -61.7782 | -29.6322 |
| Bottom | 0.791 | 201] 1.5 [DL + LL] | 5431.9627 | 61.8189 | 20.0252 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5368.194 | -29.6322 | 15.8494 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5431.9627 | 20.0252 | 15.8494 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.822 | 201] 1.5 [DL + LL] | 5656.1587 | -61.4529 | -25.1629 |
| Bottom | 0.831 | 201] 1.5 [DL + LL] | 5719.9273 | 61.6461 | 20.6252 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5656.1587 | -25.1629 | 14.6153 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5719.9273 | 20.6252 | 14.6153 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 201] 1.5 [DL + LL] | 5947.8649 | -61.1086 | -19.8294 |
| Bottom | 0.872 | 201] 1.5 [DL + LL] | 6011.6335 | 61.1681 | 24.2347 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5947.8649 | -19.8294 | 14.0791 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6011.6335 | 24.2347 | 14.0791 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.905 | 201] 1.5 [DL + LL] | 6242.8139 | -61.142 | -11.6629 |
| Bottom | 0.915 | 201] 1.5 [DL + LL] | 6306.5825 | 62.6491 | 1.7548 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6242.8139 | -11.6629 | 4.3748 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6306.5825 | 1.7548 | 4.3748 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.946 | 201] 1.5 [DL + LL] | 6546.9061 | -60.0179 | -24.4017 |
| Bottom | 0.955 | 201] 1.5 [DL + LL] | 6612.6992 | 58.9111 | 26.7757 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6546.9061 | -24.4017 | 15.8403 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6612.6992 | 26.7757 | 15.8403 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.126 | 201] 1.5 [DL + LL] | 6838.6823 | -234.1426 | -60.5246 |
| Bottom | 1.143 | 201] 1.5 [DL + LL] | 6923.7072 | 236.6424 | 102.6746 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6838.6823 | -60.5246 | 38.9518 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6923.7072 | 102.6746 | 38.9518 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.105 | 201] 1.5 [DL + LL] | 7276.193 | -167.0726 | -102.5127 |
| Bottom | 1.106 | 201] 1.5 [DL + LL] | 7357.5739 | 169.2645 | 21.2557 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7276.193 | -102.5127 | 30.853 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7357.5739 | 21.2557 | 30.853 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.356 | 201] 1.5 [DL + LL] | 1133.2576 | 48.5265 | 143.0635 |
| Bottom | 0.311 | 201] 1.5 [DL + LL] | 1175.7701 | -44.422 | 15.1076 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1133.2576 | 143.0635 | -40.7688 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1175.7701 | 15.1076 | -40.7688 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.339 | 201] 1.5 [DL + LL] | 1320.645 | 43.7006 | -30.0989 |
| Bottom | 0.344 | 201] 1.5 [DL + LL] | 1363.1575 | -43.8588 | 23.4846 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1320.645 | -30.0989 | 16.9082 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1363.1575 | 23.4846 | 16.9082 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.374 | 201] 1.5 [DL + LL] | 1510.0698 | 45.5183 | -23.0266 |
| Bottom | 0.382 | 201] 1.5 [DL + LL] | 1552.5822 | -44.9953 | 25.5529 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1510.0698 | -23.0266 | 15.3032 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1552.5822 | 25.5529 | 15.3032 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.41 | 201] 1.5 [DL + LL] | 1700.6132 | 45.0154 | -21.8445 |
| Bottom | 0.418 | 201] 1.5 [DL + LL] | 1743.1257 | -44.8042 | 25.7427 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1700.6132 | -21.8445 | 14.9829 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1743.1257 | 25.7427 | 14.9829 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 900 | 0.0025 | 0.0026 | 201] 1.5 [DL + LL] | 1891.7198 | 44.7657 | -22.8216 | 360000 |
| Bottom | 900 | 0.0025 | 0.0026 | 201] 1.5 [DL + LL] | 1934.2322 | -44.4205 | 26.0789 | 360000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1891.7198 | -22.8216 | 15.3963 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1934.2322 | 26.0789 | 15.3963 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.483 | 201] 1.5 [DL + LL] | 2083.1926 | 44.286 | -23.9505 |
| Bottom | 0.491 | 201] 1.5 [DL + LL] | 2125.705 | -43.8243 | 26.7276 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2083.1926 | -23.9505 | 15.9572 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2125.705 | 26.7276 | 15.9572 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.519 | 201] 1.5 [DL + LL] | 2274.851 | 43.5995 | -25.0657 |
| Bottom | 0.527 | 201] 1.5 [DL + LL] | 2317.3634 | -43.0299 | 27.6189 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2274.851 | -25.0657 | 16.591 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2317.3634 | 27.6189 | 16.591 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.555 | 201] 1.5 [DL + LL] | 2466.5009 | 42.6713 | -26.2341 |
| Bottom | 0.563 | 201] 1.5 [DL + LL] | 2509.0133 | -42.0229 | 28.7436 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2466.5009 | -26.2341 | 17.3167 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2509.0133 | 28.7436 | 17.3167 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.591 | 201] 1.5 [DL + LL] | 2657.9252 | 41.4642 | -27.4708 |
| Bottom | 0.599 | 201] 1.5 [DL + LL] | 2700.4377 | -40.6683 | 29.3419 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2657.9252 | -27.4708 | 17.8975 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2700.4377 | 29.3419 | 17.8975 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.627 | 201] 1.5 [DL + LL] | 2848.959 | 40.1902 | -29.5937 |
| Bottom | 0.635 | 201] 1.5 [DL + LL] | 2891.4714 | -39.7775 | 30.9406 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2848.959 | -29.5937 | 19.0744 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2891.4714 | 30.9406 | 19.0744 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.635 | 201] 1.5 [DL + LL] | 3039.0979 | 37.275 | -31.1626 |
| Bottom | 0.641 | 201] 1.5 [DL + LL] | 3081.6103 | -35.6504 | 71.3239 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3039.0979 | -31.1626 | 32.442 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3081.6103 | 71.3239 | 32.442 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.675 | 201] 1.5 [DL + LL] | 3226.9954 | 37.8546 | 8.5545 |
| Bottom | 0.69 | 201] 1.5 [DL + LL] | 3269.5078 | -38.3604 | -184.0834 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3226.9954 | 8.5545 | -61.3071 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3269.5078 | -184.0834 | -61.3071 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.644 | 201] 1.5 [DL + LL] | 3453.8687 | 93.2299 | 703.8482 |
| Bottom | 0.55 | 201] 1.5 [DL + LL] | 3517.6374 | -82.7187 | 48.3838 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3453.8687 | 703.8482 | -208.4037 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3517.6374 | 48.3838 | -208.4037 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.552 | 201] 1.5 [DL + LL] | 3698.793 | 65.118 | -43.471 |
| Bottom | 0.558 | 201] 1.5 [DL + LL] | 3762.5617 | -66.947 | 19.3298 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3698.793 | -43.471 | 19.8952 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3762.5617 | 19.3298 | 19.8952 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.59 | 201] 1.5 [DL + LL] | 3936.4284 | 68.7051 | -68.2306 |
| Bottom | 0.592 | 201] 1.5 [DL + LL] | 4000.1971 | -66.0839 | 43.6644 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3936.4284 | -68.2306 | 35.4138 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4000.1971 | 43.6644 | 35.4138 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.614 | 201] 1.5 [DL + LL] | 4169.4216 | 64.8193 | -39.5098 |
| Bottom | 0.622 | 201] 1.5 [DL + LL] | 4233.1903 | -62.8766 | 44.304 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4169.4216 | -39.5098 | 26.489 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4233.1903 | 44.304 | 26.489 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.644 | 201] 1.5 [DL + LL] | 4396.5744 | 61.2596 | -33.7266 |
| Bottom | 0.652 | 201] 1.5 [DL + LL] | 4460.3431 | -59.2766 | 40.2638 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4396.5744 | -33.7266 | 23.3825 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4460.3431 | 40.2638 | 23.3825 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.674 | 201] 1.5 [DL + LL] | 4617.6022 | 57.5264 | -32.7713 |
| Bottom | 0.682 | 201] 1.5 [DL + LL] | 4681.3709 | -55.8821 | 38.1044 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4617.6022 | -32.7713 | 22.4051 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4681.3709 | 38.1044 | 22.4051 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.702 | 201] 1.5 [DL + LL] | 4832.0167 | 52.3869 | -30.126 |
| Bottom | 0.709 | 201] 1.5 [DL + LL] | 4895.7854 | -48.911 | 43.5445 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4832.0167 | -30.126 | 23.3099 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4895.7854 | 43.5445 | 23.3099 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.732 | 201] 1.5 [DL + LL] | 5040.4539 | 53.1213 | -19.6696 |
| Bottom | 0.743 | 201] 1.5 [DL + LL] | 5104.2226 | -60.462 | 54.6074 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5040.4539 | -19.6696 | 23.5577 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5104.2226 | 54.6074 | 23.5577 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.743 | 201] 1.5 [DL + LL] | 5235.8806 | 16.5213 | -3.8657 |
| Bottom | 0.758 | 201] 1.5 [DL + LL] | 5301.6737 | 32.4035 | -58.9833 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5235.8806 | -3.8657 | -16.9391 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5301.6737 | -58.9833 | -16.9391 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.95 | 201] 1.5 [DL + LL] | 5790.8089 | -196.3755 | 31.5508 |
| Bottom | 0.968 | 201] 1.5 [DL + LL] | 5875.8338 | 198.8753 | -83.9226 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5790.8089 | 31.5508 | -27.5994 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5875.8338 | -83.9226 | -27.5994 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.972 | 201] 1.5 [DL + LL] | 6391.8206 | -154.3783 | 32.749 |
| Bottom | 0.987 | 201] 1.5 [DL + LL] | 6473.2016 | 156.5702 | 49.8969 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6391.8206 | 32.749 | 4.0927 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6473.2016 | 49.8969 | 4.0927 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.36 | 201] 1.5 [DL + LL] | 1163.7121 | -47.9974 | 145.6824 |
| Bottom | 0.312 | 201] 1.5 [DL + LL] | 1206.2245 | 43.3794 | 11.7714 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1163.7121 | 145.6824 | -42.6356 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1206.2245 | 11.7714 | -42.6356 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.344 | 201] 1.5 [DL + LL] | 1355.0121 | -42.6322 | -36.5642 |
| Bottom | 0.348 | 201] 1.5 [DL + LL] | 1397.5246 | 42.6746 | 25.0977 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1355.0121 | -36.5642 | 19.4909 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1397.5246 | 25.0977 | 19.4909 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.38 | 201] 1.5 [DL + LL] | 1548.4731 | -44.5491 | -24.9155 |
| Bottom | 0.387 | 201] 1.5 [DL + LL] | 1590.9856 | 43.93 | 27.1301 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1548.4731 | -24.9155 | 16.4202 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1590.9856 | 27.1301 | 16.4202 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.416 | 201] 1.5 [DL + LL] | 1743.0489 | -43.9352 | -23.8036 |
| Bottom | 0.425 | 201] 1.5 [DL + LL] | 1785.5613 | 43.7333 | 27.2735 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1743.0489 | -23.8036 | 16.1087 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1785.5613 | 27.2735 | 16.1087 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.454 | 201] 1.5 [DL + LL] | 1938.111 | -43.5879 | -24.8679 |
| Bottom | 0.462 | 201] 1.5 [DL + LL] | 1980.6234 | 43.3063 | 27.7097 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1938.111 | -24.8679 | 16.5825 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1980.6234 | 27.7097 | 16.5825 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.491 | 201] 1.5 [DL + LL] | 2133.4599 | -43.029 | -25.9537 |
| Bottom | 0.499 | 201] 1.5 [DL + LL] | 2175.9724 | 42.6623 | 28.3999 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2133.4599 | -25.9537 | 17.1438 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2175.9724 | 28.3999 | 17.1438 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.528 | 201] 1.5 [DL + LL] | 2328.9334 | -42.2912 | -27.0821 |
| Bottom | 0.536 | 201] 1.5 [DL + LL] | 2371.4458 | 41.8344 | 29.2861 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2328.9334 | -27.0821 | 17.7811 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2371.4458 | 29.2861 | 17.7811 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.565 | 201] 1.5 [DL + LL] | 2524.37 | -41.3434 | -28.3111 |
| Bottom | 0.573 | 201] 1.5 [DL + LL] | 2566.8825 | 40.8143 | 30.3659 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2524.37 | -28.3111 | 18.5122 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2566.8825 | 30.3659 | 18.5122 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.602 | 201] 1.5 [DL + LL] | 2719.597 | -40.1603 | -29.6512 |
| Bottom | 0.61 | 201] 1.5 [DL + LL] | 2762.1094 | 39.4861 | 30.9669 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2719.597 | -29.6512 | 19.1263 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2762.1094 | 30.9669 | 19.1263 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.64 | 201] 1.5 [DL + LL] | 2914.5047 | -38.9459 | -31.8334 |
| Bottom | 0.648 | 201] 1.5 [DL + LL] | 2957.0172 | 38.5882 | 32.3685 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2914.5047 | -31.8334 | 20.2581 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2957.0172 | 32.3685 | 20.2581 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.648 | 201] 1.5 [DL + LL] | 3108.6918 | -36.3094 | -33.6516 |
| Bottom | 0.654 | 201] 1.5 [DL + LL] | 3151.2043 | 34.7936 | 73.3042 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3108.6918 | -33.6516 | 33.879 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3151.2043 | 73.3042 | 33.879 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.689 | 201] 1.5 [DL + LL] | 3300.7779 | -36.8934 | 6.7754 |
| Bottom | 0.702 | 201] 1.5 [DL + LL] | 3343.2904 | 37.1103 | -189.2388 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3300.7779 | 6.7754 | -62.372 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3343.2904 | -189.2388 | -62.372 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.648 | 201] 1.5 [DL + LL] | 3537.2468 | -91.3621 | 702.1756 |
| Bottom | 0.56 | 201] 1.5 [DL + LL] | 3601.0154 | 81.4082 | 58.8431 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3537.2468 | 702.1756 | -204.5639 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3601.0154 | 58.8431 | -204.5639 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.563 | 201] 1.5 [DL + LL] | 3789.9381 | -63.7618 | -47.5772 |
| Bottom | 0.57 | 201] 1.5 [DL + LL] | 3853.7067 | 65.8028 | 27.6916 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3789.9381 | -47.5772 | 23.8596 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3853.7067 | 27.6916 | 23.8596 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.601 | 201] 1.5 [DL + LL] | 4034.4532 | -66.7364 | -72.8639 |
| Bottom | 0.603 | 201] 1.5 [DL + LL] | 4098.2218 | 64.5002 | 49.3368 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4034.4532 | -72.8639 | 38.6965 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4098.2218 | 49.3368 | 38.6965 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.627 | 201] 1.5 [DL + LL] | 4273.5606 | -62.8007 | -45.647 |
| Bottom | 0.635 | 201] 1.5 [DL + LL] | 4337.3293 | 61.1285 | 49.3797 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4273.5606 | -45.647 | 30.0598 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4337.3293 | 49.3797 | 30.0598 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.659 | 201] 1.5 [DL + LL] | 4506.0901 | -59.1403 | -39.1039 |
| Bottom | 0.667 | 201] 1.5 [DL + LL] | 4569.8588 | 57.3996 | 44.734 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4506.0901 | -39.1039 | 26.5198 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4569.8588 | 44.734 | 26.5198 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.689 | 201] 1.5 [DL + LL] | 4731.7877 | -55.3603 | -37.3497 |
| Bottom | 0.697 | 201] 1.5 [DL + LL] | 4795.5564 | 53.9468 | 41.8588 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4731.7877 | -37.3497 | 25.0615 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4795.5564 | 41.8588 | 25.0615 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.717 | 201] 1.5 [DL + LL] | 4950.1758 | -50.1409 | -33.9754 |
| Bottom | 0.724 | 201] 1.5 [DL + LL] | 5013.9444 | 46.8085 | 46.4134 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4950.1758 | -33.9754 | 25.4538 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5013.9444 | 46.4134 | 25.4538 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.748 | 201] 1.5 [DL + LL] | 5161.9047 | -51.0903 | -22.8789 |
| Bottom | 0.759 | 201] 1.5 [DL + LL] | 5225.6734 | 59.0346 | 54.4271 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5161.9047 | -22.8789 | 24.5293 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5225.6734 | 54.4271 | 24.5293 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.759 | 201] 1.5 [DL + LL] | 5359.5032 | -12.8626 | -8.1796 |
| Bottom | 0.777 | 201] 1.5 [DL + LL] | 5425.2963 | -38.1119 | -66.6501 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5359.5032 | -8.1796 | -17.975 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5425.2963 | -66.6501 | -17.975 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.969 | 201] 1.5 [DL + LL] | 5889.3859 | 201.5206 | 41.5236 |
| Bottom | 0.986 | 201] 1.5 [DL + LL] | 5974.4108 | -204.0203 | -86.9525 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5889.3859 | 41.5236 | -30.6993 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5974.4108 | -86.9525 | -30.6993 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.029 | 201] 1.5 [DL + LL] | 6476.9514 | 193.0577 | 32.6612 |
| Bottom | 1.044 | 201] 1.5 [DL + LL] | 6558.3324 | -195.2496 | 49.8951 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6476.9514 | 32.6612 | 4.1121 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6558.3324 | 49.8951 | 4.1121 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.436 | 201] 1.5 [DL + LL] | 1037.1544 | -80.8833 | -77.2776 |
| Bottom | 0.371 | 201] 1.5 [DL + LL] | 1079.6668 | 68.6393 | -29.6035 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1037.1544 | -77.2776 | 15.1443 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1079.6668 | -29.6035 | 15.1443 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.395 | 201] 1.5 [DL + LL] | 1305.0377 | -60.3838 | 77.0428 |
| Bottom | 0.394 | 201] 1.5 [DL + LL] | 1347.5501 | 62.1589 | -47.9746 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1305.0377 | 77.0428 | -39.6777 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1347.5501 | -47.9746 | -39.6777 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.441 | 201] 1.5 [DL + LL] | 1570.9233 | -63.2347 | 61.098 |
| Bottom | 0.446 | 201] 1.5 [DL + LL] | 1613.4358 | 62.9125 | -54.2128 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1570.9233 | 61.098 | -36.5561 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1613.4358 | -54.2128 | -36.5561 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.484 | 201] 1.5 [DL + LL] | 1835.8364 | -62.2618 | 54.2205 |
| Bottom | 0.492 | 201] 1.5 [DL + LL] | 1878.3489 | 62.4648 | -54.1486 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1835.8364 | 54.2205 | -34.339 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1878.3489 | -54.1486 | -34.339 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.523 | 201] 1.5 [DL + LL] | 2100.2505 | -62.2401 | 52.3051 |
| Bottom | 0.531 | 201] 1.5 [DL + LL] | 2142.7629 | 62.4235 | -52.9185 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2100.2505 | 52.3051 | -33.3355 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2142.7629 | -52.9185 | -33.3355 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.572 | 201] 1.5 [DL + LL] | 2364.713 | -62.331 | 51.2786 |
| Bottom | 0.581 | 201] 1.5 [DL + LL] | 2407.2254 | 62.5694 | -51.5953 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2364.713 | 51.2786 | -32.5859 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2407.2254 | -51.5953 | -32.5859 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.608 | 201] 1.5 [DL + LL] | 2629.7452 | -62.6688 | 50.1975 |
| Bottom | 0.617 | 201] 1.5 [DL + LL] | 2672.2576 | 62.9578 | -50.366 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2629.7452 | 50.1975 | -31.8492 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2672.2576 | -50.366 | -31.8492 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 201] 1.5 [DL + LL] | 2895.8715 | -63.211 | 48.8572 |
| Bottom | 0.668 | 201] 1.5 [DL + LL] | 2938.3839 | 63.55 | -48.9972 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2895.8715 | 48.8572 | -30.9871 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2938.3839 | -48.9972 | -30.9871 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.693 | 201] 1.5 [DL + LL] | 3163.6275 | -64.0091 | 47.4538 |
| Bottom | 0.702 | 201] 1.5 [DL + LL] | 3206.14 | 64.4827 | -47.2412 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3163.6275 | 47.4538 | -29.9827 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3206.14 | -47.2412 | -29.9827 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.744 | 201] 1.5 [DL + LL] | 3433.536 | -64.8215 | 46.3412 |
| Bottom | 0.752 | 201] 1.5 [DL + LL] | 3476.0485 | 65.0063 | -47.2862 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3433.536 | 46.3412 | -29.6436 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3476.0485 | -47.2862 | -29.6436 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.796 | 201] 1.5 [DL + LL] | 3706.3433 | -67.024 | 42.806 |
| Bottom | 0.815 | 201] 1.5 [DL + LL] | 3748.8558 | 68.6304 | -83.2227 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3706.3433 | 42.806 | -40.0085 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3748.8558 | -83.2227 | -40.0085 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.845 | 201] 1.5 [DL + LL] | 3982.0996 | -64.8139 | -0.9173 |
| Bottom | 0.866 | 201] 1.5 [DL + LL] | 4024.6121 | 59.8829 | 230.972 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3982.0996 | -0.9173 | 73.7785 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4024.6121 | 230.972 | 73.7785 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.723 | 201] 1.5 [DL + LL] | 4247.9227 | -70.9659 | -890.2601 |
| Bottom | 0.635 | 201] 1.5 [DL + LL] | 4311.6914 | 64.6337 | -75.5087 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4247.9227 | -890.2601 | 259.1744 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4311.6914 | -75.5087 | 259.1744 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.663 | 201] 1.5 [DL + LL] | 4526.2168 | -62.0156 | -18.0651 |
| Bottom | 0.673 | 201] 1.5 [DL + LL] | 4589.9855 | 62.6319 | 1.5837 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4526.2168 | -18.0651 | 6.2083 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4589.9855 | 1.5837 | 6.2083 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.702 | 201] 1.5 [DL + LL] | 4807.7269 | -61.7991 | 53.2531 |
| Bottom | 0.712 | 201] 1.5 [DL + LL] | 4871.4955 | 61.6725 | -18.2574 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4807.7269 | 53.2531 | -22.668 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4871.4955 | -18.2574 | -22.668 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.742 | 201] 1.5 [DL + LL] | 5091.4053 | -60.9411 | 31.9622 |
| Bottom | 0.751 | 201] 1.5 [DL + LL] | 5155.174 | 60.8774 | -23.8244 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5091.4053 | 31.9622 | -17.6378 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5155.174 | -23.8244 | -17.6378 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.782 | 201] 1.5 [DL + LL] | 5377.6386 | -60.2959 | 22.882 |
| Bottom | 0.791 | 201] 1.5 [DL + LL] | 5441.4072 | 60.2181 | -23.4844 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5377.6386 | 22.882 | -14.6449 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5441.4072 | -23.4844 | -14.6449 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.823 | 201] 1.5 [DL + LL] | 5666.7307 | -59.7388 | 19.1259 |
| Bottom | 0.832 | 201] 1.5 [DL + LL] | 5730.4994 | 59.8493 | -23.6265 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5666.7307 | 19.1259 | -13.5082 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5730.4994 | -23.6265 | -13.5082 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.864 | 201] 1.5 [DL + LL] | 5959.186 | -59.0096 | 14.2766 |
| Bottom | 0.872 | 201] 1.5 [DL + LL] | 6022.9547 | 58.7115 | -27.085 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5959.186 | 14.2766 | -13.0942 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6022.9547 | -27.085 | -13.0942 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.906 | 201] 1.5 [DL + LL] | 6254.5389 | -59.3883 | 6.3713 |
| Bottom | 0.916 | 201] 1.5 [DL + LL] | 6318.3076 | 61.8014 | -4.4349 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6254.5389 | 6.3713 | -3.4363 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6318.3076 | -4.4349 | -3.4363 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.946 | 201] 1.5 [DL + LL] | 6558.4488 | -54.8735 | 19.2291 |
| Bottom | 0.952 | 201] 1.5 [DL + LL] | 6624.2418 | 48.261 | -37.724 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6558.4488 | 19.2291 | -17.5331 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6624.2418 | -37.724 | -17.5331 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.11 | 201] 1.5 [DL + LL] | 6815.055 | -224.0857 | 51.6898 |
| Bottom | 1.126 | 201] 1.5 [DL + LL] | 6900.0799 | 226.5854 | -76.0978 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6815.055 | 51.6898 | -30.4563 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6900.0799 | -76.0978 | -30.4563 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.084 | 201] 1.5 [DL + LL] | 7122.3444 | -170.8251 | 54.3679 |
| Bottom | 1.09 | 201] 1.5 [DL + LL] | 7203.7254 | 173.017 | -6.759 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7122.3444 | 54.3679 | -15.2554 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7203.7254 | -6.759 | -15.2554 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.412 | 201] 1.5 [DL + LL] | 1587.8578 | 33.5628 | 205.5196 |
| Bottom | 0.365 | 201] 1.5 [DL + LL] | 1630.3702 | -29.3544 | 1.6171 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1587.8578 | 205.5196 | -64.817 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1630.3702 | 1.6171 | -64.817 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.406 | 201] 1.5 [DL + LL] | 1804.7572 | 26.3317 | -78.3158 |
| Bottom | 0.414 | 201] 1.5 [DL + LL] | 1847.2696 | -27.859 | 39.0153 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1804.7572 | -78.3158 | 37.1879 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1847.2696 | 39.0153 | 37.1879 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.45 | 201] 1.5 [DL + LL] | 2023.0294 | 27.6466 | -45.0154 |
| Bottom | 0.458 | 201] 1.5 [DL + LL] | 2065.5418 | -27.9631 | 44.1287 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2023.0294 | -45.0154 | 28.1872 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2065.5418 | 44.1287 | 28.1872 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.494 | 201] 1.5 [DL + LL] | 2242.2746 | 28.7129 | -40.638 |
| Bottom | 0.503 | 201] 1.5 [DL + LL] | 2284.787 | -28.6814 | 43.978 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2242.2746 | -40.638 | 26.7455 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2284.787 | 43.978 | 26.7455 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.539 | 201] 1.5 [DL + LL] | 2462.32 | 29.5582 | -40.7691 |
| Bottom | 0.548 | 201] 1.5 [DL + LL] | 2504.8325 | -29.4321 | 43.5311 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2462.32 | -40.7691 | 26.6465 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2504.8325 | 43.5311 | 26.6465 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.584 | 201] 1.5 [DL + LL] | 2682.9704 | 30.2527 | -40.9904 |
| Bottom | 0.593 | 201] 1.5 [DL + LL] | 2725.4828 | -30.0851 | 43.0334 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2682.9704 | -40.9904 | 26.5595 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2725.4828 | 43.0334 | 26.5595 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.602 | 201] 1.5 [DL + LL] | 2904.0262 | 30.8559 | -41.1054 |
| Bottom | 0.611 | 201] 1.5 [DL + LL] | 2946.5387 | -30.6434 | 42.6348 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2904.0262 | -41.1054 | 26.4693 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2946.5387 | 42.6348 | 26.4693 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.647 | 201] 1.5 [DL + LL] | 3125.2806 | 31.3724 | -40.9381 |
| Bottom | 0.656 | 201] 1.5 [DL + LL] | 3167.793 | -31.084 | 42.4344 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3125.2806 | -40.9381 | 26.3525 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3167.793 | 42.4344 | 26.3525 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.709 | 201] 1.5 [DL + LL] | 3346.5125 | 31.8592 | -40.3298 |
| Bottom | 0.717 | 201] 1.5 [DL + LL] | 3389.0249 | -31.634 | 41.3421 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3346.5125 | -40.3298 | 25.814 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3389.0249 | 41.3421 | 25.814 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 201] 1.5 [DL + LL] | 3567.4557 | 31.9235 | -40.4086 |
| Bottom | 0.763 | 201] 1.5 [DL + LL] | 3609.9681 | -31.0691 | 38.6495 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3567.4557 | -40.4086 | 24.9789 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3609.9681 | 38.6495 | 24.9789 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.783 | 201] 1.5 [DL + LL] | 3788.0926 | 33.5789 | -41.9882 |
| Bottom | 0.788 | 201] 1.5 [DL + LL] | 3830.605 | -33.8267 | 80.5824 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3788.0926 | -41.9882 | 38.8425 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3830.605 | 80.5824 | 38.8425 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.829 | 201] 1.5 [DL + LL] | 4008.7227 | 31.4914 | 3.3655 |
| Bottom | 0.838 | 201] 1.5 [DL + LL] | 4051.2351 | -29.6586 | -218.8196 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4008.7227 | 3.3655 | -70.7443 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4051.2351 | -218.8196 | -70.7443 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.72 | 201] 1.5 [DL + LL] | 4230.4858 | 66.6756 | 895.7885 |
| Bottom | 0.629 | 201] 1.5 [DL + LL] | 4294.2544 | -59.8249 | 40.4042 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4230.4858 | 895.7885 | -271.9709 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4294.2544 | 40.4042 | -271.9709 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.659 | 201] 1.5 [DL + LL] | 4491.1911 | 66.9282 | -65.1196 |
| Bottom | 0.668 | 201] 1.5 [DL + LL] | 4554.9598 | -64.6716 | 30.6158 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4491.1911 | -65.1196 | 30.3647 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4554.9598 | 30.6158 | 30.3647 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.693 | 201] 1.5 [DL + LL] | 4749.732 | 62.4958 | -71.5134 |
| Bottom | 0.703 | 201] 1.5 [DL + LL] | 4813.5007 | -62.2297 | 52.9965 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4749.732 | -71.5134 | 39.4279 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4813.5007 | 52.9965 | 39.4279 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 201] 1.5 [DL + LL] | 5005.2281 | 62.1706 | -46.0223 |
| Bottom | 0.738 | 201] 1.5 [DL + LL] | 5068.9967 | -61.2227 | 50.6252 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5005.2281 | -46.0223 | 30.5799 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5068.9967 | 50.6252 | 30.5799 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.765 | 201] 1.5 [DL + LL] | 5258.2549 | 61.452 | -44.8471 |
| Bottom | 0.774 | 201] 1.5 [DL + LL] | 5322.0236 | -60.3406 | 49.3797 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5258.2549 | -44.8471 | 29.8217 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5322.0236 | 49.3797 | 29.8217 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.8 | 201] 1.5 [DL + LL] | 5508.8366 | 60.6703 | -42.5245 |
| Bottom | 0.808 | 201] 1.5 [DL + LL] | 5572.6052 | -59.4152 | 50.0203 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5508.8366 | -42.5245 | 29.3029 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5572.6052 | 50.0203 | 29.3029 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.835 | 201] 1.5 [DL + LL] | 5756.7967 | 59.9073 | -38.0383 |
| Bottom | 0.843 | 201] 1.5 [DL + LL] | 5820.5653 | -58.4748 | 50.664 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5756.7967 | -38.0383 | 28.1123 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5820.5653 | 50.664 | 28.1123 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.869 | 201] 1.5 [DL + LL] | 6001.9173 | 59.1142 | -33.1055 |
| Bottom | 0.877 | 201] 1.5 [DL + LL] | 6065.686 | -57.138 | 45.34 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6001.9173 | -33.1055 | 24.8992 | 390.4166 | 702.2079 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6065.686 | 45.34 | 24.8992 | 390.4166 | 702.2079 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.903 | 201] 1.5 [DL + LL] | 6244.0333 | 59.0481 | -34.1955 |
| Bottom | 0.914 | 201] 1.5 [DL + LL] | 6309.8263 | -61.841 | 20.205 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6244.0333 | -34.1955 | 16.7515 | 370.8346 | 682.6259 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6309.8263 | 20.205 | 16.7515 | 370.8346 | 682.6259 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.05 | 201] 1.5 [DL + LL] | 6490.7814 | 209.0963 | -27.4811 |
| Bottom | 1.062 | 201] 1.5 [DL + LL] | 6575.8063 | -211.5961 | -13.9925 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6490.7814 | -27.4811 | 3.1546 | 266.1932 | 577.9845 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6575.8063 | -13.9925 | 3.1546 | 266.1932 | 577.9845 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.058 | 201] 1.5 [DL + LL] | 6722.427 | 192.0242 | -32.1198 |
| Bottom | 1.074 | 201] 1.5 [DL + LL] | 6803.808 | -194.2162 | 64.6672 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6722.427 | -32.1198 | 23.9286 | 279.1431 | 590.9344 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6803.808 | 64.6672 | 23.9286 | 279.1431 | 590.9344 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 420.6013 | -41.4815 | 31.3075 | 480000 |
| Bottom | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 499.238 | 48.0688 | 185.4258 | 480000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 420.6013 | 31.3075 | 35.2748 | 325.2571 | 602.4049 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 499.238 | 185.4258 | 35.2748 | 325.2571 | 602.4049 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 1102.6886 | -47.418 | -385.648 | 480000 |
| Bottom | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 1155.773 | 15.3611 | 127.2464 | 480000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1102.6886 | -385.648 | 173.9996 | 920.6519 | 1197.7997 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1155.773 | 127.2464 | 173.9996 | 920.6519 | 1197.7997 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.076 | 201] 1.5 [DL + LL] | 3836.5666 | 3684.9737 | 2008.223 |
| Bottom | 0.075 | 201] 1.5 [DL + LL] | 4493.9724 | 3232.1814 | 1495.7776 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 192.2788 | 13.4931 | 27.2531 | 20.2814 | 66.4727 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1008.4721 | 28.4375 | 105.4655 | 662.5252 | 939.673 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 168.7522 | 301.7401 | -238.0367 | 1647.5495 | 2132.5581 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 160.4374 | 14.663 | -6.7058 | 52.5814 | 144.964 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 54.1796 | -4.9919 | 42.6933 | 399.0209 | 641.5252 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 140.3239 | -245.2079 | 108.403 | 802.8048 | 1091.5004 |
| Top | Leg 7 | 641.63 | 201] 1.5 [DL + LL] | 12.3401 | -10.0701 | -94.3754 | 20.2814 | 94.3754 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 41.1957 | -37.7488 | 13.0749 | 52.5814 | 144.964 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 159.0197 | 365.9023 | -325.8653 | 1647.5495 | 2132.5581 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 764.8171 | -210.4235 | 141.7948 | 399.0209 | 641.5252 |
| Top | Leg 11 | 592.32 | 201] 1.5 [DL + LL] | 530.7525 | 29.0966 | 88.6819 | 20.2814 | 88.6819 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | -170.0657 | -121.5763 | 171.4754 | 399.0209 | 641.5252 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1007.5103 | -643.2565 | 49.8035 | 802.8048 | 1091.5004 |
| Top | Leg 14 | OS | 201] 1.5 [DL + LL] | -293.3841 | 16.6488 | 356.7507 | 20.2814 | 66.4727 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 59.937 | -7.1181 | 33.7218 | 399.0209 | 641.5252 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 17.3614 | -14.0184 | 24.16 | 20.2814 | 66.4727 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 753.1111 | 43.1509 | 85.7683 | 662.5252 | 939.673 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 705.0241 | 272.1249 | -245.0006 | 1647.5495 | 2132.5581 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 45.1453 | -11.6527 | -9.0145 | 52.5814 | 144.964 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 269.7646 | 2.5045 | -22.7047 | 399.0209 | 641.5252 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 54.1038 | 242.8595 | 96.0272 | 802.8048 | 1091.5004 |
| Bottom | Leg 7 | 905.18 | 201] 1.5 [DL + LL] | 33.9971 | 6.756 | -124.8099 | 20.2814 | 124.8099 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 25.6688 | 3.6098 | 9.7408 | 52.5814 | 144.964 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 639.3283 | 262.4275 | -331.8258 | 1647.5495 | 2132.5581 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 750.0961 | 14.5544 | -148.4949 | 399.0209 | 641.5252 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 98.9905 | -15.2692 | 27.2359 | 20.2814 | 66.4727 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 301.8386 | 8.7499 | -34.0463 | 399.0209 | 641.5252 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 204.4044 | 268.9232 | 102.9288 | 802.8048 | 1091.5004 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 239.2027 | -42.9588 | 30.2143 | 20.2814 | 66.4727 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 355.9355 | 0.6547 | 12.9965 | 399.0209 | 641.5252 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 0

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.082 | 201] 1.5 [DL + LL] | 5761.6469 | 2553.9461 | 1183.1778 |
| Bottom | 0.087 | 201] 1.5 [DL + LL] | 6398.5089 | 2344.1638 | 1080.6383 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 227.0684 | 13.069 | 32.6921 | 20.4483 | 66.6396 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 751.6485 | 8.0173 | 13.6495 | 743.6507 | 1020.7986 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 706.7836 | 347.6625 | -225.7619 | 1665.0766 | 2150.0853 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 106.032 | -0.3165 | -0.4911 | 53.4958 | 145.8784 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 272.6469 | 3.6598 | -5.5186 | 430.6414 | 673.1457 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 482.1225 | -164.9544 | 67.5065 | 920.1739 | 1208.8695 |
| Top | Leg 7 | 867.97 | 201] 1.5 [DL + LL] | -6.1684 | -10.2984 | -120.68 | 20.4483 | 120.68 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 102.8954 | 9.3009 | -5.1263 | 53.4958 | 145.8784 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 668.715 | 382.7919 | -283.6107 | 1665.0766 | 2150.0853 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 774.9432 | 85.5842 | -88.1036 | 430.6414 | 673.1457 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 267.1522 | 13.8874 | 32.7856 | 20.4483 | 66.6396 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 313.662 | 20.9634 | -42.2995 | 430.6414 | 673.1457 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 550.3806 | -83.5568 | 88.9044 | 920.1739 | 1208.8695 |
| Top | Leg 14 | 814.36 | 201] 1.5 [DL + LL] | 165.4806 | -2.3819 | 114.4889 | 20.4483 | 114.4889 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 378.2845 | 0.5382 | 9.6444 | 430.6414 | 673.1457 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 30.6093 | -12.1386 | 27.9922 | 20.4483 | 66.6396 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 788.1477 | 14.9261 | 23.8005 | 743.6507 | 1020.7986 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1006.878 | 212.0479 | -191.7203 | 1665.0766 | 2150.0853 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 101.4416 | -1.9809 | -0.2048 | 53.4958 | 145.8784 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 476.5252 | 6.7211 | 12.4603 | 430.6414 | 673.1457 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 283.6555 | 252.8339 | 66.267 | 920.1739 | 1208.8695 |
| Bottom | Leg 7 | 762.14 | 201] 1.5 [DL + LL] | 89.1298 | 11.069 | -108.4585 | 20.4483 | 108.4585 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 115.1849 | -1.9814 | -4.604 | 53.4958 | 145.8784 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1029.9772 | 203.5407 | -243.2674 | 1665.0766 | 2150.0853 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 740.4721 | -11.6898 | -80.4419 | 430.6414 | 673.1457 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 66.374 | -12.9989 | 28.9537 | 20.4483 | 66.6396 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 514.5988 | -0.9891 | -29.5219 | 430.6414 | 673.1457 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 498.6171 | 148.8666 | 86.7906 | 920.1739 | 1208.8695 |
| Bottom | Leg 14 | 606.65 | 201] 1.5 [DL + LL] | 106.0298 | -5.1518 | 90.5027 | 20.4483 | 90.5027 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 550.8677 | 1.1648 | -6.0374 | 430.6414 | 673.1457 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.098 | 201] 1.5 [DL + LL] | 7552.8397 | 1822.6847 | 737.9911 |
| Bottom | 0.105 | 201] 1.5 [DL + LL] | 8199.9736 | 1758.2181 | 718.4903 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 229.2572 | 12.6393 | 30.9764 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 807.8101 | 1.6992 | -1.9145 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1004.725 | 269.3038 | -175.3934 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 169.3772 | 5.6655 | -3.321 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 474.3207 | 3.2929 | 13.7831 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 663.6624 | -134.7343 | 51.3683 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 786.24 | 201] 1.5 [DL + LL] | 43.6677 | -8.1654 | -111.1564 | 20.3633 | 111.1564 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 175.0505 | -2.3948 | 0.9007 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1049.4844 | 296.769 | -204.8627 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 775.6041 | 34.4304 | -30.4382 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 234.839 | 12.9883 | 31.4326 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 516.8752 | 6.7967 | -26.5453 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 769.78 | -139.3805 | 54.5985 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 533.51 | 201] 1.5 [DL + LL] | 73.6251 | 8.8149 | 81.9725 | 20.3633 | 81.9725 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 564.761 | 4.9881 | -7.1065 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 51.9429 | -11.8282 | 27.1933 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 884.3712 | 11.7538 | 3.2946 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1296.8703 | 162.2932 | -151.418 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 171.005 | -3.7434 | -2.2425 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 635.2696 | 5.1684 | 10.6186 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 509.7607 | 225.0079 | 53.0777 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 692.64 | 201] 1.5 [DL + LL] | 119.7634 | 9.3837 | -100.3479 | 20.3633 | 100.3479 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 186.4226 | 1.0188 | -0.0649 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1330.097 | 145.821 | -172.7525 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 794.3407 | -13.3166 | -24.0998 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 75.0313 | -12.5444 | 27.0143 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 669.9842 | 0.7352 | -16.0826 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 646.4041 | 173.3288 | 53.6284 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 506.41 | 201] 1.5 [DL + LL] | 133.6902 | -8.0497 | 78.843 | 20.3633 | 78.843 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 695.0207 | 0.7278 | -12.1584 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.119 | 201] 1.5 [DL + LL] | 9331.553 | 1319.0769 | 442.1714 |
| Bottom | 0.128 | 201] 1.5 [DL + LL] | 9978.6869 | 1386.2396 | 430.2457 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 245.5312 | 12.2152 | 31.5211 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 918.1711 | 4.6515 | -8.5738 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1292.8134 | 209.9493 | -140.664 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 237.3656 | 4.2662 | -2.9953 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 632.3309 | 1.6322 | 15.8138 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 861.2243 | -138.4936 | 49.903 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 732.36 | 201] 1.5 [DL + LL] | 81.1807 | -8.0623 | -104.9347 | 20.3633 | 104.9347 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 245.0542 | -0.3655 | 0.1633 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1345.1367 | 224.9468 | -153.5736 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 838.7973 | 22.3472 | -11.8715 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 244.7792 | 12.5844 | 32.2579 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 670.1505 | 6.3916 | -22.0495 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 909.9146 | -109.6392 | 41.3029 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 537.88 | 201] 1.5 [DL + LL] | 103.0153 | 7.2361 | 82.4764 | 20.3633 | 82.4764 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 706.088 | 5.4987 | -12.475 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 77.6743 | -11.4282 | 26.8614 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1006.5601 | 10.5675 | -3.6683 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1578.3654 | 129.7661 | -125.2945 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 233.9651 | -3.1138 | -1.2958 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 784.7636 | 3.2602 | 11.604 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 719.7651 | 209.9198 | 53.3115 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 627.51 | 201] 1.5 [DL + LL] | 152.02 | 9.1119 | -92.8271 | 20.3633 | 92.8271 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 247.865 | 0.1901 | -1.0845 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1603.2637 | 109.8937 | -134.8493 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 884.4486 | -14.1764 | -9.0526 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 93.5715 | -12.0876 | 26.8415 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 805.5252 | -1.2823 | -14.548 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 806.0169 | 165.0321 | 42.7124 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 474.67 | 201] 1.5 [DL + LL] | 157.7712 | -7.6215 | 75.1779 | 20.3633 | 75.1779 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 827.1112 | -0.6229 | -13.0892 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.141 | 201] 1.5 [DL + LL] | 11081.7111 | 1020.8056 | 197.7614 |
| Bottom | 0.15 | 201] 1.5 [DL + LL] | 11728.845 | 1143.2633 | 190.0719 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 264.3998 | 11.8122 | 31.7544 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1051.4886 | 6.9387 | -11.1923 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1573.3988 | 171.3206 | -119.6808 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 299.6481 | 4.1672 | -3.1228 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 782.566 | -0.9375 | 18.505 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1043.6753 | -132.5352 | 49.2715 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 683.9 | 201] 1.5 [DL + LL] | 118.787 | -7.4472 | -99.3385 | 20.3633 | 99.3385 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 305.3791 | -1.2165 | 0.7079 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1617.5473 | 183.0121 | -128.071 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 936.0705 | 16.5482 | -6.693 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 259.8217 | 12.2148 | 32.3699 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 805.1653 | 3.9709 | -20.9199 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1055.9744 | -107.125 | 38.9649 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 517.1 | 201] 1.5 [DL + LL] | 130.637 | 6.8119 | 80.0772 | 20.3633 | 80.0772 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 837.1521 | 4.159 | -13.0591 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 105.1947 | -10.8495 | 26.3501 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1138.5734 | 6.9807 | -5.3201 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1851.4787 | 106.1415 | -111.2256 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 293.0265 | -2.8148 | -0.7822 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 930.6893 | 0.0397 | 12.5632 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 919.5995 | 198.1311 | 53.3468 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 563.05 | 201] 1.5 [DL + LL] | 179.2221 | 8.6842 | -85.3834 | 20.3633 | 85.3834 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 303.977 | 0.0599 | -1.1185 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1864.9152 | 86.7633 | -118.9073 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 987.7578 | -12.6096 | -4.3252 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 115.2064 | -11.4577 | 26.6556 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 935.8325 | -1.5026 | -12.2805 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 965.0008 | 159.7152 | 42.1424 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 430.62 | 201] 1.5 [DL + LL] | 181.1428 | -7.5326 | 70.0911 | 20.3633 | 70.0911 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 957.2282 | -1.5656 | -10.7867 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.163 | 201] 1.5 [DL + LL] | 12798.8013 | 843.9126 | -3.9591 |
| Bottom | 0.171 | 201] 1.5 [DL + LL] | 13445.9352 | 998.9031 | 2.9806 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 283.0153 | 11.9493 | 31.091 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1192.8172 | 4.3452 | -5.6087 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1846.285 | 144.6793 | -109.671 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 358.1944 | 3.6006 | -3.1451 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 929.7788 | -5.3691 | 24.6949 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1215.9854 | -123.401 | 58.2499 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 638.79 | 201] 1.5 [DL + LL] | 151.231 | -6.9548 | -94.1297 | 20.3633 | 94.1297 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 361.2828 | -1.5481 | 1.1066 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1879.5332 | 158.3294 | -119.0351 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1045.3204 | 16.1992 | -12.0178 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 275.2085 | 12.3825 | 31.5418 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 936.2914 | 3.8883 | -22.3251 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1199.769 | -101.1005 | 44.6868 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 500.52 | 201] 1.5 [DL + LL] | 157.2769 | 6.2431 | 78.163 | 20.3633 | 78.163 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 966.8119 | 2.5546 | -10.5827 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 131.6452 | -11.0659 | 28.6013 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1267.8561 | 13.8168 | -1.2074 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2126.4618 | 87.6001 | -107.9891 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 349.5839 | -2.7774 | -0.1554 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1078.0631 | -5.552 | 14.7907 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1111.0135 | 196.8908 | 56.3199 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 577.46 | 201] 1.5 [DL + LL] | 189.9291 | 7.0024 | -87.0471 | 20.3633 | 87.0471 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 357.7674 | -0.1931 | -1.3698 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2130.765 | 71.3347 | -116.7467 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1089.8245 | -21.1292 | -6.487 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 136.0632 | -11.7414 | 29.3839 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1070.084 | 0.8217 | -9.2979 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1124.9802 | 159.4917 | 42.7562 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 452.57 | 201] 1.5 [DL + LL] | 191.7815 | -6.4203 | 72.6254 | 20.3633 | 72.6254 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1090.1167 | -1.9285 | -5.937 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.185 | 201] 1.5 [DL + LL] | 14588.3444 | 754.9412 | -164.2403 |
| Bottom | 0.193 | 201] 1.5 [DL + LL] | 15235.4783 | 770.6452 | -92.7809 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 309.4424 | 12.5002 | 32.8006 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1342.75 | -8.5046 | 6.8219 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2122.1798 | 125.6194 | -111.7722 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 412.8186 | 2.4272 | -2.1371 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1076.4758 | -12.4741 | 35.8228 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1400.5949 | -105.4439 | 46.053 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 653.85 | 201] 1.5 [DL + LL] | 181.9909 | -5.7585 | -95.8685 | 20.3633 | 95.8685 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 413.5202 | -2.427 | 1.663 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2145.7637 | 142.2332 | -121.5121 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1166.404 | 22.9632 | -18.6306 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 299.4562 | 12.9086 | 33.2108 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1069.9798 | 6.0884 | -24.9086 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1360.6397 | -90.6973 | 34.8747 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 531.65 | 201] 1.5 [DL + LL] | 186.4875 | 5.0459 | 81.7569 | 20.3633 | 81.7569 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1099.8409 | 1.0094 | -5.6049 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 151.0521 | -12.1684 | 28.7502 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1417.9528 | 25.446 | 4.812 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2414.7045 | 71.6887 | -110.8255 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 413.9389 | -1.4291 | 0.7981 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1210.7813 | 4.7805 | 26.7039 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1279.3012 | 174.2386 | 45.9639 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 569.95 | 201] 1.5 [DL + LL] | 228.3402 | 6.8544 | -86.1798 | 20.3633 | 86.1798 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 418.7822 | 0.5377 | -0.6838 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2406.4476 | 58.4425 | -118.7137 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1215.4421 | -29.2446 | -6.7147 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 153.8411 | -12.6997 | 29.581 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1195.2397 | -7.5812 | -13.5234 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1280.796 | 143.9828 | 35.1638 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 462.63 | 201] 1.5 [DL + LL] | 225.2408 | -5.9736 | 73.7872 | 20.3633 | 73.7872 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1223.618 | -2.078 | -1.3589 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.207 | 201] 1.5 [DL + LL] | 16393.9816 | 587.3739 | -241.8103 |
| Bottom | 0.215 | 201] 1.5 [DL + LL] | 17041.1155 | 651.4458 | -168.9373 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 332.6946 | 12.9217 | 35.1295 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1502.0014 | -5.8571 | 3.5761 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2410.5538 | 109.0619 | -108.5735 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 475.5587 | 2.8297 | -2.0901 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1209.5591 | -3.0118 | 31.9272 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1555.792 | -126.2658 | 49.0799 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 620.9 | 201] 1.5 [DL + LL] | 226.6762 | -6.3754 | -92.0637 | 20.3633 | 92.0637 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 473.3995 | -2.4507 | 1.6941 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2421.5313 | 128.9579 | -120.6602 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1299.6715 | 21.6277 | -15.992 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 323.1076 | 13.2659 | 35.7799 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1195.6952 | -2.6545 | -18.0024 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1508.654 | -108.6487 | 37.6067 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 511.32 | 201] 1.5 [DL + LL] | 225.8828 | 5.6438 | 79.4094 | 20.3633 | 79.4094 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1233.2041 | -0.2195 | -1.2905 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 184.4468 | -12.309 | 26.8365 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1563.2051 | 24.4774 | 6.7013 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2689.1582 | 57.1894 | -105.6285 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 472.2396 | -1.4531 | 0.6189 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1347.9477 | 1.1305 | 16.5389 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1466.7625 | 167.6704 | 55.3802 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 529.01 | 201] 1.5 [DL + LL] | 255.1555 | 6.6335 | -81.4531 | 20.3633 | 81.4531 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 474.3 | 0.9219 | -0.4148 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2672.495 | 48.5763 | -114.643 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1339.161 | -28.2437 | -8.5713 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 185.3084 | -12.744 | 27.7748 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1327.9126 | -3.5979 | -2.7811 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1456.7983 | 142.0792 | 43.2223 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 436.75 | 201] 1.5 [DL + LL] | 249.9653 | -5.7486 | 70.7988 | 20.3633 | 70.7988 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1356.2594 | -2.347 | 0.5816 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.229 | 201] 1.5 [DL + LL] | 18175.7357 | 500.8155 | -299.9011 |
| Bottom | 0.237 | 201] 1.5 [DL + LL] | 18822.8696 | 549.1317 | -232.7009 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 359.4425 | 12.3189 | 35.3759 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1651.5416 | -4.2758 | 3.8971 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2684.098 | 92.9465 | -102.849 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 533.2852 | 2.6197 | -2.1422 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1347.8112 | -5.496 | 29.0364 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1730.2168 | -119.0943 | 47.4845 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 597.56 | 201] 1.5 [DL + LL] | 255.1907 | -5.8185 | -89.3682 | 20.3633 | 89.3682 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 528.7222 | -2.2873 | 1.7784 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2687.4248 | 119.0016 | -116.42 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1425.3254 | 19.9554 | -16.9145 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 349.1442 | 12.5874 | 36.0644 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1329.2759 | 0.0924 | -15.7121 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1677.2776 | -101.8828 | 37.0948 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 498.7 | 201] 1.5 [DL + LL] | 251.6475 | 5.2147 | 77.9519 | 20.3633 | 77.9519 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1365.3319 | -0.9614 | 0.4733 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 213.2473 | -11.782 | 26.048 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1711.0146 | 22.5248 | 8.7944 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2957.932 | 45.8737 | -100.2702 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 528.8053 | -1.2049 | 1.0328 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1486.1789 | -0.8615 | 15.3709 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1646.6768 | 161.0016 | 52.4144 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 487.18 | 201] 1.5 [DL + LL] | 282.8049 | 6.5015 | -76.6217 | 20.3633 | 76.6217 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 528.6413 | 0.6628 | -0.7842 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2936.5907 | 42.1584 | -110.5163 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1465.6424 | -26.3833 | -9.4662 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 212.214 | -12.149 | 27.0674 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1462.8247 | -1.9176 | -2.3759 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1626.4883 | 139.776 | 41.3197 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 406.03 | 201] 1.5 [DL + LL] | 276.2287 | -5.7146 | 67.2508 | 20.3633 | 67.2508 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1487.5797 | -2.5395 | 1.1977 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.251 | 201] 1.5 [DL + LL] | 19934.87 | 425.8196 | -348.0032 |
| Bottom | 0.259 | 201] 1.5 [DL + LL] | 20582.004 | 466.9505 | -286.3336 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 382.5583 | 11.9987 | 35.425 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1802.8179 | -4.3783 | 4.6059 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2953.0249 | 80.0597 | -96.8589 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 589.4773 | 2.5412 | -2.2657 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1486.2233 | -7.5168 | 31.0758 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1897.0981 | -113.2533 | 45.4352 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 573.59 | 201] 1.5 [DL + LL] | 284.9382 | -5.4351 | -86.6004 | 20.3633 | 86.6004 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 583.0367 | -2.4245 | 2.0017 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2952.0343 | 111.9609 | -111.8487 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1553.422 | 19.633 | -18.0338 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 371.404 | 12.2364 | 36.0609 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1464.2179 | 1.9644 | -18.5462 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1838.8731 | -96.1075 | 35.3624 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 485.75 | 201] 1.5 [DL + LL] | 279.2493 | 4.8726 | 76.4564 | 20.3633 | 76.4564 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1496.4949 | -1.326 | 0.9917 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 241.8388 | -11.3917 | 24.993 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1857.9381 | 22.45 | 10.2043 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3226.3881 | 38.1585 | -94.7625 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 583.4686 | -0.9201 | 1.3841 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1621.6809 | -1.1038 | 15.1847 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1819.5161 | 153.2725 | 50.8117 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 449.43 | 201] 1.5 [DL + LL] | 309.6863 | 6.2785 | -72.2632 | 20.3633 | 72.2632 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 581.8197 | 0.4704 | -1.0118 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3201.7273 | 37.6865 | -106.0991 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1591.2219 | -26.0313 | -9.8383 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 239.303 | -11.7327 | 26.0246 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1595.2394 | -2.1879 | -2.8518 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1790.5691 | 134.6071 | 40.0627 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 302.2209 | -5.5652 | 63.9999 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1619.3857 | -2.7483 | 1.361 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.272 | 201] 1.5 [DL + LL] | 21669.1427 | 366.7431 | -387.8308 |
| Bottom | 0.28 | 201] 1.5 [DL + LL] | 22316.2767 | 404.3771 | -331.6944 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 404.8719 | 11.5954 | 35.1264 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1952.655 | -2.5321 | 4.597 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3221.6039 | 70.7658 | -91.0119 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 643.8655 | 2.5393 | -2.3924 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1621.961 | -7.7956 | 31.7013 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2056.9659 | -107.996 | 43.2672 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 545.11 | 201] 1.5 [DL + LL] | 314.0047 | -5.094 | -83.3112 | 20.3633 | 83.3112 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 636.2292 | -2.5039 | 2.1574 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3217.5411 | 106.7003 | -107.0286 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1680.3429 | 17.7425 | -18.2649 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 393.0593 | 11.8091 | 35.7054 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1596.7062 | 1.8611 | -19.7872 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1994.3915 | -92.0788 | 33.8018 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 466.96 | 201] 1.5 [DL + LL] | 306.812 | 4.5774 | 74.2875 | 20.3633 | 74.2875 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1628.1326 | -1.6039 | 1.1109 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 270.5014 | -10.9348 | 23.8378 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2004.273 | 22.1436 | 10.5858 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3491.0733 | 32.8189 | -89.3696 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 636.7265 | -0.7313 | 1.619 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1754.4475 | -1.405 | 13.4445 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1988.2652 | 145.7634 | 49.0069 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 411.74 | 201] 1.5 [DL + LL] | 335.4099 | 6.0011 | -67.9099 | 20.3633 | 67.9099 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 634.0771 | 0.3243 | -1.1807 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3463.7579 | 34.2919 | -101.1928 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1716.4809 | -25.337 | -9.3681 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 266.6847 | -11.258 | 24.8633 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1725.2025 | -2.411 | -1.7718 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1951.9603 | 129.05 | 38.9129 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 327.366 | -5.3589 | 60.6306 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1750.0506 | -2.9684 | 1.4231 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.294 | 201] 1.5 [DL + LL] | 23376.2305 | 323.5394 | -420.9826 |
| Bottom | 0.302 | 201] 1.5 [DL + LL] | 24023.3644 | 357.7642 | -370.1096 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 426.7003 | 11.1461 | 34.6773 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2101.5034 | -0.7834 | 4.5865 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3486.2642 | 63.7941 | -85.3387 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 696.9016 | 2.5021 | -2.4907 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1755.005 | -7.8288 | 31.1301 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2212.6097 | -101.9211 | 40.7088 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 515 | 201] 1.5 [DL + LL] | 342.1285 | -4.7529 | -79.8349 | 20.3633 | 79.8349 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 688.5047 | -2.5296 | 2.2624 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3479.7589 | 102.3426 | -101.9236 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1806.7121 | 16.0557 | -18.5078 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 414.3537 | 11.339 | 35.2026 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1726.8199 | 1.5112 | -19.8363 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2146.5995 | -87.4839 | 31.957 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 445.38 | 201] 1.5 [DL + LL] | 333.8123 | 4.282 | 71.7952 | 20.3633 | 71.7952 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1758.5567 | -1.8627 | 1.1448 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 299.2727 | -10.4269 | 22.5381 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2149.5697 | 21.7812 | 11.065 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3750.6878 | 29.3307 | -84.1004 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 688.5455 | -0.5511 | 1.8436 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1884.7091 | -1.877 | 11.2148 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2153.6718 | 138.5357 | 46.8111 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 360.302 | 5.7142 | -63.3964 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 685.1737 | 0.1677 | -1.3533 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3721.3178 | 32.2084 | -95.9729 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1841.0512 | -24.5002 | -9.0565 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 294.3349 | -10.7374 | 23.5489 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1853.0334 | -2.4267 | -0.2308 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2111.1687 | 123.441 | 37.4485 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 351.8553 | -5.1391 | 56.9921 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1878.6708 | -3.1778 | 1.4483 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.315 | 201] 1.5 [DL + LL] | 25053.6469 | 293.2315 | -448.5323 |
| Bottom | 0.323 | 201] 1.5 [DL + LL] | 25700.7808 | 324.031 | -402.5862 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 448.0035 | 10.6386 | 34.1216 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2248.9623 | 1.0075 | 4.6525 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3745.8466 | 58.7093 | -79.7877 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 748.5718 | 2.4573 | -2.5807 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1885.5561 | -7.9361 | 30.2513 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2364.5867 | -94.9466 | 37.8781 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 483.59 | 201] 1.5 [DL + LL] | 369.5668 | -4.3967 | -76.2077 | 20.3633 | 76.2077 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 739.6711 | -2.5395 | 2.3504 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3737.4689 | 99.2155 | -96.6565 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1932.1596 | 14.4186 | -18.8723 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 435.2261 | 10.8121 | 34.5948 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1854.8315 | 1.2799 | -19.6044 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2295.8695 | -82.0218 | 29.8269 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 421.52 | 201] 1.5 [DL + LL] | 360.39 | 3.9689 | 69.0394 | 20.3633 | 69.0394 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1886.9364 | -2.0949 | 1.1468 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 328.065 | -9.8649 | 21.0971 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2293.2907 | 21.3995 | 11.6781 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4004.8287 | 27.4133 | -78.8981 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 738.902 | -0.3669 | 2.0682 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2012.4091 | -2.4529 | 8.8825 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2315.8719 | 131.3784 | 44.3935 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 384.4406 | 5.416 | -58.6865 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 734.9849 | 0.0015 | -1.5302 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3973.9252 | 31.4356 | -90.5885 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1964.4902 | -23.5711 | -8.9172 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 322.134 | -10.1653 | 22.0883 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1978.6444 | -2.3037 | 1.4008 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2268.1378 | 117.6233 | 35.7379 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 375.7232 | -4.9026 | 53.0641 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2004.9333 | -3.3669 | 1.4478 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.335 | 201] 1.5 [DL + LL] | 26698.7228 | 273.2085 | -471.282 |
| Bottom | 0.343 | 201] 1.5 [DL + LL] | 27345.8567 | 301.0928 | -429.9323 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 468.6391 | 10.072 | 33.4484 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2394.5689 | 2.9159 | 4.649 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3999.9614 | 55.2019 | -74.2764 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 798.8471 | 2.4047 | -2.6649 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2013.5596 | -8.1249 | 29.2668 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2512.8758 | -87.1835 | 34.9095 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 450.59 | 201] 1.5 [DL + LL] | 396.4029 | -4.0213 | -72.3972 | 20.3633 | 72.3972 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 789.6176 | -2.5424 | 2.4322 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3990.2011 | 97.3152 | -91.3019 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2056.2757 | 12.7415 | -19.2164 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 455.5297 | 10.2261 | 33.8723 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1980.6478 | 1.1664 | -19.2761 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2442.0421 | -75.7975 | 27.5431 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 386.5911 | 3.6333 | 66.0067 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2012.9629 | -2.2954 | 1.1258 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 356.9046 | -9.2485 | 19.4969 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2435.0079 | 20.86 | 12.2901 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4253.0345 | 26.6576 | -73.7064 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 787.8576 | -0.1802 | 2.2923 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2137.3432 | -3.1974 | 6.647 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2474.9023 | 124.3255 | 41.9012 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 407.7746 | 5.1037 | -53.7389 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 783.5344 | -0.1659 | -1.7043 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4221.012 | 31.5707 | -85.1204 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2086.4314 | -22.4463 | -8.8191 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 350.0884 | -9.5395 | 20.4666 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2101.7945 | -1.9749 | 2.9458 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2422.7704 | 111.6953 | 33.9335 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 398.8879 | -4.6455 | 48.8219 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2128.5131 | -3.539 | 1.4216 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.356 | 201] 1.5 [DL + LL] | 28308.5498 | 261.6993 | -489.8533 |
| Bottom | 0.364 | 201] 1.5 [DL + LL] | 28955.6837 | 288.1902 | -452.8088 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 488.5713 | 9.445 | 32.6507 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2537.9411 | 4.8393 | 4.5654 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4248.1628 | 52.8391 | -68.7776 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 847.7908 | 2.3291 | -2.7287 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2138.8152 | -8.5398 | 28.587 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2657.3663 | -78.5032 | 32.0676 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 415.8 | 201] 1.5 [DL + LL] | 422.5818 | -3.6251 | -68.3793 | 20.3633 | 68.3793 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 838.3818 | -2.536 | 2.5045 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4237.3986 | 96.235 | -85.9874 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2178.7078 | 11.0914 | -19.5441 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 475.2327 | 9.5779 | 33.0303 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2104.0307 | 1.3129 | -19.239 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2584.9217 | -68.6669 | 25.3774 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 412.334 | 3.2713 | 62.6919 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2136.3132 | -2.4697 | 1.0813 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 385.8209 | -8.5836 | 17.7316 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2574.291 | 20.1487 | 12.9515 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4495.6115 | 26.5901 | -68.591 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 835.5663 | -0.0031 | 2.4983 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2258.9353 | -3.9377 | 5.6268 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2630.1639 | 117.525 | 39.6035 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 430.0775 | 4.7685 | -48.5685 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 830.9843 | -0.3083 | -1.8485 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4462.7215 | 31.8616 | -79.7314 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2206.4778 | -21.1666 | -8.8628 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 378.2048 | -8.8644 | 18.6781 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2221.8787 | -1.603 | 3.3147 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2574.4067 | 105.8769 | 32.3025 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 421.0889 | -4.3575 | 44.2998 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2249.4546 | -3.7067 | 1.3558 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.375 | 201] 1.5 [DL + LL] | 29879.9471 | 258.1257 | -504.7589 |
| Bottom | 0.383 | 201] 1.5 [DL + LL] | 30527.081 | 283.2221 | -471.6139 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 507.7655 | 8.7312 | 31.7593 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2678.6401 | 6.7513 | 5.0114 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4490.9148 | 51.2121 | -63.4856 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 895.5983 | 2.1756 | -2.6984 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2260.71 | -9.3172 | 29.8319 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2797.2431 | -68.7859 | 29.5 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 447.8162 | -3.237 | -64.0404 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 886.1795 | -2.4665 | 2.4943 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4479.3494 | 95.2847 | -81.0887 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2299.0266 | 9.4403 | -20.3766 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 494.295 | 8.8405 | 32.1023 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2224.3315 | 1.856 | -21.077 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2723.6758 | -60.4648 | 23.3471 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 437.3041 | 2.9115 | 58.9863 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2257.0972 | -2.628 | 1.0008 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 414.0981 | -7.85 | 15.9436 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2711.0022 | 20.0761 | 14.045 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4735.5606 | 26.9377 | -63.7923 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 882.4986 | 0.1579 | 2.6453 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2376.0379 | -3.1103 | 7.9224 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2778.2061 | 109.7918 | 37.7143 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 451.3152 | 4.3536 | -43.4556 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 877.8611 | -0.4247 | -1.918 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4701.8878 | 31.6433 | -74.5391 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2324.4157 | -20.4647 | -9.4876 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 405.7717 | -8.1221 | 16.85 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2337.5595 | -2.7951 | 0.392 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2719.6345 | 98.8006 | 30.8964 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 442.3415 | -3.979 | 39.7943 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2368.8908 | -3.8723 | 1.2355 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.387 | 201] 1.5 [DL + LL] | 31409.2448 | 260.76 | -516.2122 |
| Bottom | 0.395 | 201] 1.5 [DL + LL] | 32056.3787 | 280.2358 | -486.7405 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 525.3647 | 7.9178 | 30.6877 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2816.5596 | 9.4333 | 6.8933 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4731.3953 | 50.1466 | -58.548 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 942.7983 | 1.8672 | -2.4433 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2378.0678 | -9.1723 | 33.5926 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2928.7182 | -59.232 | 26.7399 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 472.0022 | -2.9568 | -58.9022 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 933.6063 | -2.2883 | 2.3041 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4719.0747 | 93.8831 | -76.6821 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2417.0155 | 7.0982 | -22.412 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 511.8921 | 7.9989 | 31.0185 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2340.1592 | 1.4648 | -25.456 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2854.5937 | -52.5942 | 20.5628 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 461.4633 | 2.6611 | 54.3943 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2376.5337 | -2.7691 | 0.8771 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 440.3471 | -6.9677 | 14.7134 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2844.7792 | 21.5483 | 15.4616 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4975.8849 | 27.6623 | -59.2428 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 928.7333 | 0.4118 | 2.7603 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2489.678 | 1.1209 | 10.7342 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2914.1339 | 98.2038 | 35.3456 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 471.7275 | 3.8362 | -38.7846 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 924.2315 | -0.5348 | -1.8883 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4941.7091 | 31.5931 | -68.9131 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2439.6503 | -20.8672 | -10.6228 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 431.501 | -7.2226 | 15.5608 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2449.527 | -7.6452 | -3.2497 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2853.0519 | 86.5503 | 28.4757 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 463.4632 | -3.4974 | 35.6704 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2487.9608 | -3.9643 | 1.1525 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.405 | 201] 1.5 [DL + LL] | 32893.8106 | 265.0686 | -524.6154 |
| Bottom | 0.413 | 201] 1.5 [DL + LL] | 33540.9445 | 288.5294 | -502.6864 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 540.4003 | 7.2041 | 28.7996 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2951.6221 | 13.7273 | 8.6992 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4971.8982 | 49.4349 | -53.389 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 989.3572 | 1.6009 | -2.1328 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2492.2479 | -4.9839 | 31.0688 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3046.8846 | -52.5479 | 23.9001 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 495.8288 | -2.7593 | -52.6045 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 980.5181 | -2.1191 | 2.0098 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4959.1822 | 92.5938 | -70.9447 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2532.2484 | 3.6681 | -25.2713 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 527.1708 | 7.2314 | 29.2021 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2452.6025 | -3.1531 | -23.8761 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2972.2008 | -48.9535 | 19.236 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 486.1116 | 2.427 | 48.7724 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2495.5373 | -2.8294 | 0.813 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 466.5658 | -6.1551 | 13.1813 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2971.8946 | 22.2141 | 16.2147 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5204.7856 | 28.88 | -54.7763 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 971.9638 | 1.0456 | 3.1791 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2606.768 | -0.0784 | -5.0671 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3050.9874 | 84.9428 | 31.1782 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 487.478 | 3.3831 | -33.8723 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 966.9833 | -1.1659 | -2.2293 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5171.516 | 35.4908 | -62.768 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2549.8347 | -21.234 | -10.9815 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 455.9759 | -6.4521 | 14.2644 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2566.9124 | -6.6041 | 12.3243 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2986.2907 | 73.578 | 26.0002 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 479.8691 | -2.5888 | 32.2129 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2603.1193 | -3.8901 | 1.4726 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.423 | 201] 1.5 [DL + LL] | 34368.0808 | 272.8707 | -529.1507 |
| Bottom | 0.431 | 201] 1.5 [DL + LL] | 35015.2147 | 291.5428 | -503.3564 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 556.4891 | 6.7257 | 26.8383 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3081.2922 | 15.3872 | 10.9094 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5199.5313 | 49.3407 | -49.4035 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1032.6301 | 1.9436 | -2.8491 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2609.642 | -2.9239 | 12.6161 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3178.9278 | -39.2059 | 19.657 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 518.3869 | -2.5568 | -47.3405 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1023.427 | -2.8728 | 3.0223 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5187.7385 | 95.3285 | -64.7258 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2643.8918 | 2.3059 | -27.3201 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 544.2318 | 6.7501 | 27.4179 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2569.5716 | -5.9999 | -4.6464 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3103.6155 | -37.3882 | 19.1845 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 508.6012 | 1.6294 | 45.3507 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2610.1041 | -2.8016 | 1.1549 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 487.0488 | -6.8033 | 10.9872 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3101.7582 | 14.4624 | 6.4308 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5408.9427 | 29.7023 | -52.1593 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1014.4206 | 0.6884 | 3.5724 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2718.2351 | -10.5494 | -14.2601 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3213.2593 | 94.7302 | 24.9058 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 507.8295 | 3.719 | -29.8783 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1007.9647 | -0.419 | -2.3648 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5376.2717 | 42.3809 | -59.8179 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2665.2029 | -14.4075 | -0.4968 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 475.6556 | -6.9474 | 12.228 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2681.0393 | 5.3791 | 22.0903 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3149.3645 | 90.7822 | 23.8705 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 496.9054 | -2.8332 | 28.7094 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2711.3165 | -3.8528 | 2.0461 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.442 | 201] 1.5 [DL + LL] | 35854.1068 | 295.0984 | -526.7701 |
| Bottom | 0.45 | 201] 1.5 [DL + LL] | 36501.2408 | 325.4572 | -492.6216 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 589.5144 | 7.3416 | 29.8014 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3207.1316 | 7.2297 | 10.0137 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5404.2525 | 49.1306 | -48.8613 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1073.4025 | 1.6471 | -3.0335 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2721.0448 | -14.2462 | 31.0789 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3336.5338 | -34.3148 | 22.2702 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 541.1734 | -2.4467 | -51.4434 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1063.0337 | -2.4113 | 3.1732 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5392.7641 | 100.8394 | -64.0793 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2755.5261 | 9.7941 | -25.7231 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 575.9232 | 7.3945 | 30.1009 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2683.64 | 6.7232 | -22.7586 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3262.8421 | -25.8098 | 17.4021 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 528.7758 | 1.5373 | 49.6955 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2718.5489 | -2.864 | 1.6288 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 509.9142 | -6.4704 | 11.2364 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3235.3397 | 20.7542 | 17.2589 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5640.3519 | 33.9527 | -52.0136 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1056.7387 | 1.5589 | 4.2676 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2832.4268 | -3.9528 | 2.8179 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3337.416 | 88.8109 | 30.598 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 531.7154 | 3.8787 | -28.5695 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1049.8513 | -1.2694 | -3.143 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5608.2348 | 49.2428 | -61.2329 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2782.2991 | -18.0539 | -9.0461 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 499.5787 | -6.6847 | 12.2314 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2795.6999 | -0.9646 | 5.2244 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3274.1481 | 83.6626 | 25.2582 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 521.2451 | -3.0561 | 27.4206 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2826.2809 | -3.7784 | 2.1723 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.397 | 201] 1.5 [DL + LL] | 37318.7622 | 327.0319 | -513.6487 |
| Bottom | 0.404 | 201] 1.5 [DL + LL] | 37965.8961 | 349.2755 | -483.6842 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 607.6395 | 6.9906 | 28.1493 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3338.2376 | 13.5015 | 8.925 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5637.6931 | 53.4922 | -47.7528 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1115.2341 | 2.1783 | -3.2664 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2835.0143 | -10.0938 | 35.0012 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3456.3952 | -33.6725 | 22.6295 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 563.8096 | -2.1306 | -48.5126 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1104.7959 | -2.7336 | 3.239 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5626.3815 | 107.3882 | -63.8574 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2870.2591 | 5.7491 | -25.1333 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 594.8859 | 7.0475 | 28.3461 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2797.9047 | 2.7571 | -26.9872 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3384.4083 | -26.6756 | 17.8684 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 551.9582 | 1.3319 | 46.8118 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2834.1452 | -2.7752 | 1.6901 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 533.1798 | -5.9776 | 10.2898 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3366.9271 | 21.6806 | 14.9655 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5866.46 | 37.0247 | -50.3083 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1100.8649 | 1.2874 | 3.9048 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2940.6769 | -2.3562 | -0.9618 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3465.838 | 83.1719 | 29.9215 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 552.1582 | 3.3621 | -26.8515 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1094.0178 | -1.1549 | -2.9022 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5834.9807 | 52.6625 | -59.2609 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2897.9394 | -17.6387 | -6.8812 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 523.4024 | -6.1892 | 11.2039 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2903.9761 | -2.6839 | 8.3613 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3403.4935 | 77.5116 | 24.7564 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 542.3503 | -2.6128 | 25.8857 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2939.631 | -3.7732 | 1.854 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.412 | 201] 1.5 [DL + LL] | 38759.8013 | 348.84 | -502.0915 |
| Bottom | 0.419 | 201] 1.5 [DL + LL] | 39406.9352 | 368.6121 | -478.5887 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 626.1529 | 6.6045 | 27.3328 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3467.7314 | 15.6015 | 8.3173 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5863.8126 | 55.3931 | -45.0765 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1158.3891 | 2.0458 | -3.2354 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2943.284 | -7.4693 | 29.9226 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3580.1254 | -29.7047 | 20.3542 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 584.5903 | -1.9701 | -45.8812 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1148.2594 | -2.5697 | 3.1207 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5852.852 | 109.3088 | -61.3652 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2983.7198 | 4.7105 | -25.3512 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 613.8929 | 6.6364 | 27.4918 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2906.2319 | 0.2378 | -22.8074 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3509.9675 | -24.2506 | 16.557 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 573.4013 | 1.2436 | 44.3302 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2947.3906 | -2.6447 | 1.3351 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 557.549 | -5.5337 | 8.9225 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3495.1035 | 21.8432 | 14.5504 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6083.8412 | 39.3548 | -47.5572 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1143.4365 | 1.3252 | 3.9427 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3048.4497 | -3.1592 | -5.7628 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3597.6425 | 79.8564 | 28.0637 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 572.6928 | 3.0708 | -24.0775 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1136.6384 | -1.2356 | -2.9662 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6053.4811 | 56.0141 | -55.5727 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3010.2245 | -16.9858 | -6.4969 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 547.8649 | -5.7299 | 9.7819 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3011.9893 | -1.9791 | 12.1428 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3535.9469 | 74.5406 | 23.7823 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 563.0991 | -2.3761 | 23.3564 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3048.9757 | -3.8491 | 1.2763 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.427 | 201] 1.5 [DL + LL] | 40174.8559 | 364.7809 | -494.2091 |
| Bottom | 0.434 | 201] 1.5 [DL + LL] | 40821.9898 | 383.6599 | -476.6646 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 645.1324 | 6.1016 | 26.7311 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3593.6282 | 17.0284 | 7.8949 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6081.3706 | 56.5774 | -42.0171 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1200.107 | 2.0484 | -3.3243 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3051.0668 | -7.3674 | 27.3189 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3706.7275 | -22.8838 | 18.083 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 605.2933 | -1.6676 | -43.6764 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1190.2656 | -2.5041 | 3.1199 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6071.1916 | 110.9879 | -57.8205 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3093.6008 | 3.7947 | -25.4312 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 633.0063 | 6.1044 | 26.8463 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3014.2952 | 0.3408 | -21.2744 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3638.0521 | -18.2747 | 14.9552 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 594.3911 | 1.0112 | 42.2868 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3056.7275 | -2.5256 | 0.7392 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 581.8524 | -4.9855 | 7.54 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3620.4934 | 21.6038 | 14.7565 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6295.7301 | 41.4218 | -44.6433 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1184.8076 | 1.4178 | 4.0526 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3155.2229 | -3.9749 | -8.0972 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3728.8143 | 76.0838 | 26.2173 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 593.1517 | 2.8049 | -20.9724 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1178.0039 | -1.3811 | -3.1186 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6266.482 | 59.2554 | -51.7531 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3119.7879 | -15.9252 | -6.3386 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 572.165 | -5.167 | 8.3364 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3118.9314 | -1.2955 | 13.3787 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3667.2549 | 71.2557 | 22.5438 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 583.637 | -2.1717 | 20.4724 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3155.6552 | -3.9586 | 0.6488 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.442 | 201] 1.5 [DL + LL] | 41560.9163 | 374.1093 | -489.4006 |
| Bottom | 0.449 | 201] 1.5 [DL + LL] | 42208.0502 | 396.4071 | -477.7664 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 663.3522 | 5.5566 | 25.948 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3716.3281 | 18.2059 | 7.391 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6293.7201 | 57.4656 | -38.7158 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1240.6692 | 2.0427 | -3.432 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3157.774 | -7.7891 | 26.7962 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3832.0707 | -15.88 | 16.2726 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 625.8074 | -1.3233 | -41.3448 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1231.0822 | -2.4553 | 3.1543 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6284.2426 | 112.3827 | -53.9068 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3200.3919 | 3.0733 | -25.4468 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 651.3089 | 5.5323 | 26.016 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3121.1908 | 0.9348 | -21.8247 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3764.3603 | -11.9935 | 13.6365 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 615.0978 | 0.7355 | 40.1308 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3163.5201 | -2.4256 | 0.1027 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 606.0104 | -4.3733 | 6.0414 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3743.07 | 21.1471 | 14.8243 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6503.3353 | 43.2275 | -41.2802 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1225.3254 | 1.5297 | 4.1851 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3259.9004 | -4.4395 | -9.2465 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3857.4212 | 71.6854 | 24.7475 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 613.2594 | 2.5056 | -17.7369 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1218.5419 | -1.5292 | -3.276 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6475.2342 | 62.0769 | -47.5968 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3226.7007 | -14.8337 | -6.1319 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 596.2004 | -4.5408 | 6.7773 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3223.541 | -1.0651 | 13.4354 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3795.5405 | 67.205 | 21.5473 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 603.788 | -1.9364 | 17.4537 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3260.1812 | -4.0827 | 0.1533 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.386 | 201] 1.5 [DL + LL] | 42914.5668 | 377.9592 | -487.5779 |
| Bottom | 0.392 | 201] 1.5 [DL + LL] | 43561.7007 | 410.5541 | -480.5091 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 680.7041 | 4.9437 | 24.9812 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3835.6232 | 19.2897 | 6.9377 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6501.9497 | 57.9529 | -34.6006 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1280.3387 | 2.0037 | -3.5006 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3262.3519 | -8.0781 | 26.9653 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3954.393 | -8.7024 | 14.4852 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 645.8587 | -0.9788 | -38.705 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1271.0648 | -2.379 | 3.1454 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6493.1417 | 113.0861 | -49.2672 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3304.0136 | 2.1945 | -25.3926 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 668.6516 | 4.8908 | 24.9994 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3225.716 | 1.2753 | -22.9593 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3887.1851 | -5.6969 | 12.1888 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 635.3458 | 0.4614 | 37.6645 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3268.2289 | -2.365 | -0.3791 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 629.8225 | -3.7307 | 4.2843 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3863.2233 | 21.0644 | 14.7756 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6706.0999 | 45.6155 | -36.7889 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1265.0261 | 1.6607 | 4.312 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3361.8518 | -4.5468 | -10.3232 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3982.5262 | 66.6379 | 23.3914 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 633.0219 | 2.1508 | -14.4256 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1258.3632 | -1.7056 | -3.4112 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6679.649 | 65.4085 | -42.1089 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3331.4483 | -14.3544 | -5.8057 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 619.7836 | -3.8847 | 4.9697 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3325.2831 | -1.3743 | 13.5549 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3919.9095 | 62.169 | 20.5625 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 623.6716 | -1.6455 | 14.3668 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3362.0207 | -4.1548 | 0.084 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.398 | 201] 1.5 [DL + LL] | 44231.8101 | 379.0075 | -487.4078 |
| Bottom | 0.404 | 201] 1.5 [DL + LL] | 44878.944 | 431.9917 | -480.1053 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 696.9968 | 4.2262 | 23.908 | 20.3633 | 66.5546 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3951.6774 | 20.8533 | 5.6622 | 700.3838 | 977.5316 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6705.3818 | 58.6693 | -28.6883 | 1656.313 | 2141.3217 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1319.0217 | 1.9477 | -3.5484 | 53.0289 | 145.4115 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3364.1578 | -7.8868 | 26.0413 | 414.0783 | 656.5826 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4072.8781 | -1.1496 | 11.7943 | 856.9751 | 1145.6708 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 665.5052 | -0.6419 | -35.6651 | 20.3633 | 66.5546 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1310.2023 | -2.3538 | 3.1459 | 53.0289 | 145.4115 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6697.6685 | 113.7548 | -42.8898 | 1656.313 | 2141.3217 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3404.78 | 0.4633 | -24.1289 | 414.0783 | 656.5826 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 684.871 | 4.1336 | 23.8678 | 20.3633 | 66.5546 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3327.3521 | 0.8843 | -22.5892 | 414.0783 | 656.5826 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4005.7342 | 0.6142 | 9.7616 | 856.9751 | 1145.6708 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 655.3337 | 0.192 | 34.7921 | 20.3633 | 66.5546 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3370.2496 | -2.3431 | -0.3946 | 414.0783 | 656.5826 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 653.8341 | -3.1394 | 1.6924 | 20.3633 | 66.5546 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3982.6156 | 21.8225 | 14.3347 | 700.3838 | 977.5316 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6898.8092 | 50.1005 | -30.6467 | 1656.313 | 2141.3217 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1304.6487 | 1.7825 | 4.4303 | 53.0289 | 145.4115 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3459.5758 | -5.7424 | -13.1631 | 414.0783 | 656.5826 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4105.7728 | 61.5882 | 21.6597 | 856.9751 | 1145.6708 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 652.9785 | 1.8124 | -10.4693 | 20.3633 | 66.5546 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1298.1242 | -1.8263 | -3.4671 | 53.0289 | 145.4115 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6875.1105 | 71.7264 | -33.8791 | 1656.313 | 2141.3217 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3435.9566 | -14.5138 | -4.6143 | 414.0783 | 656.5826 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 643.5159 | -3.2664 | 2.3517 | 20.3633 | 66.5546 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3423.3004 | -0.6399 | 16.1161 | 414.0783 | 656.5826 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4042.3168 | 57.0318 | 19.2091 | 856.9751 | 1145.6708 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 643.9058 | -1.3665 | 10.6605 | 20.3633 | 66.5546 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3458.479 | -4.0371 | 0.7016 | 414.0783 | 656.5826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.409 | 201] 1.5 [DL + LL] | 45508.009 | 382.1072 | -484.326 |
| Bottom | 0.415 | 201] 1.5 [DL + LL] | 46175.6869 | 469.4486 | -468.017 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 712.6695 | 3.314 | 22.7235 | 20.2023 | 66.3936 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4065.8633 | 22.8486 | 4.5351 | 629.1206 | 906.2684 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6898.9308 | 61.169 | -20.5684 | 1638.7859 | 2123.7946 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1357.2031 | 1.9073 | -3.61 | 52.1521 | 144.5347 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3461.7962 | -8.5721 | 24.0965 | 385.2728 | 627.7772 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4189.3917 | 7.1936 | 8.2537 | 755.8571 | 1044.5528 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 685.1385 | -0.2091 | -31.9002 | 20.2023 | 66.3936 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1348.8971 | -2.4219 | 3.2345 | 52.1521 | 144.5347 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6893.0494 | 116.4547 | -34.2446 | 1638.7859 | 2123.7946 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3504.492 | -1.919 | -22.4486 | 385.2728 | 627.7772 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 700.4661 | 3.1992 | 22.5317 | 20.2023 | 66.3936 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3425.4092 | 1.1181 | -20.0343 | 385.2728 | 627.7772 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4122.1884 | 7.6743 | 7.1986 | 755.8571 | 1044.5528 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 675.6188 | -0.2175 | 31.288 | 20.2023 | 66.3936 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3466.895 | -2.2876 | 0.306 | 385.2728 | 627.7772 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 679.0484 | -2.6086 | -2.3038 | 20.2023 | 66.3936 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4103.3334 | 25.9284 | 14.3516 | 629.1206 | 906.2684 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7078.9724 | 58.9196 | -25.4523 | 1638.7859 | 2123.7946 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1346.295 | 2.3129 | 4.6979 | 52.1521 | 144.5347 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3551.4104 | -10.7196 | -16.1173 | 385.2728 | 627.7772 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4232.0271 | 59.6491 | 18.8677 | 755.8571 | 1044.5528 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 673.8816 | 1.633 | -4.9505 | 20.2023 | 66.3936 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1339.5101 | -2.2366 | -3.6108 | 52.1521 | 144.5347 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7059.8029 | 85.9472 | -24.1589 | 1638.7859 | 2123.7946 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3541.125 | -18.7345 | -4.7117 | 385.2728 | 627.7772 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 669.3241 | -2.7345 | -1.8423 | 20.2023 | 66.3936 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3515.8236 | 4.2547 | 17.7713 | 385.2728 | 627.7772 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4170.8161 | 57.1136 | 17.4672 | 755.8571 | 1044.5528 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 663.9705 | -1.2797 | 5.0719 | 20.2023 | 66.3936 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3550.3462 | -3.5708 | 1.7567 | 385.2728 | 627.7772 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.421 | 201] 1.5 [DL + LL] | 46755.6367 | 397.5043 | -483.8158 |
| Bottom | 0.428 | 201] 1.5 [DL + LL] | 47618.4819 | 459.0753 | -443.8484 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 728.946 | 2.1223 | 23.6902 | 19.0953 | 65.2866 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4180.3609 | 28.9804 | 4.7247 | 347.037 | 624.1848 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7079.2442 | 69.0984 | -17.531 | 1472.2782 | 1957.2869 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1397.9468 | 2.6652 | -4.4194 | 46.3953 | 138.7779 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3552.9039 | -13.6185 | 31.303 | 248.447 | 490.9513 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4307.7764 | 21.189 | -0.9613 | 388.5608 | 677.2565 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 706.5923 | 0.8401 | -30.8661 | 19.0953 | 65.2866 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1389.8759 | -3.1618 | 3.9408 | 46.3953 | 138.7779 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7077.534 | 128.7977 | -30.6259 | 1472.2782 | 1957.2869 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3604.3608 | -8.5942 | -21.6725 | 248.447 | 490.9513 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 716.2441 | 1.7685 | 23.5418 | 19.0953 | 65.2866 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3517.6354 | 6.5026 | -28.7282 | 248.447 | 490.9513 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4239.9651 | 20.8672 | -1.863 | 388.5608 | 677.2565 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 696.8149 | -1.1173 | 30.1735 | 19.0953 | 65.2866 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3559.4361 | -1.9731 | 1.4105 | 248.447 | 490.9513 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 702.0025 | -1.2929 | -6.7779 | 19.0953 | 65.2866 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4229.3452 | 44.3699 | 15.8519 | 347.037 | 624.1848 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7294.2743 | 66.0715 | -31.0726 | 1472.2782 | 1957.2869 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1393.4477 | 3.0552 | 5.3709 | 46.3953 | 138.7779 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3653.6524 | -10.9929 | -20.6258 | 248.447 | 490.9513 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4368.8421 | 48.3486 | 12.1012 | 388.5608 | 677.2565 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 695.2406 | 0.4725 | 1.5332 | 19.0953 | 65.2866 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1386.4597 | -2.7425 | -4.1182 | 46.3953 | 138.7779 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7278.2673 | 100.4781 | -22.0514 | 1472.2782 | 1957.2869 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3654.4238 | -27.1404 | -0.172 | 248.447 | 490.9513 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 691.4111 | -1.4521 | -7.6853 | 19.0953 | 65.2866 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3619.9094 | 5.743 | 24.2028 | 248.447 | 490.9513 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4308.6037 | 47.3118 | 11.0782 | 388.5608 | 677.2565 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 685.3027 | -0.2131 | -1.0809 | 19.0953 | 65.2866 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3657.2992 | -3.1651 | 1.797 | 248.447 | 490.9513 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.433 | 201] 1.5 [DL + LL] | 48130.0282 | 361.8318 | -452.1035 |
| Bottom | 0.44 | 201] 1.5 [DL + LL] | 48955.8943 | 173.3943 | -427.1682 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 735.841 | 0.1534 | 25.4937 | 19.2605 | 65.4518 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4304.1918 | 50.2289 | -15.2617 | 375.0804 | 652.2282 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7295.3177 | 74.0905 | -34.2763 | 1503.8271 | 1988.8357 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1443.8826 | 2.9444 | -4.5375 | 47.2253 | 139.6079 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3654.659 | -13.2541 | 34.9173 | 263.9749 | 506.4792 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4427.7031 | 32.3547 | -10.2643 | 422.8995 | 711.5951 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 729.7449 | 1.1247 | -27.0515 | 19.2605 | 65.4518 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1435.8474 | -3.2096 | 3.8357 | 47.2253 | 139.6079 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7296.8141 | 141.3116 | -47.022 | 1503.8271 | 1988.8357 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3707.4628 | -25.4273 | -3.3069 | 263.9749 | 506.4792 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 725.2083 | -0.0623 | 23.6298 | 19.2605 | 65.4518 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3620.9398 | 7.1535 | -31.9065 | 263.9749 | 506.4792 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4367.1883 | 34.0222 | -11.3903 | 422.8995 | 711.5951 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 719.6739 | -1.3605 | 27.0704 | 19.2605 | 65.4518 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3665.5536 | -1.475 | 1.2242 | 263.9749 | 506.4792 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 751.6873 | 0.2539 | -20.884 | 19.2605 | 65.4518 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4387.4588 | 68.6105 | -1.0063 | 375.0804 | 652.2282 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7477.2679 | 36.2 | -48.0705 | 1503.8271 | 1988.8357 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1523.9864 | 1.5369 | 0.7927 | 47.2253 | 139.6079 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3648.1089 | -23.3865 | -29.4278 | 263.9749 | 506.4792 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4499.3312 | 81.7432 | 24.7115 | 422.8995 | 711.5951 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 739.4858 | 0.0703 | 20.4077 | 19.2605 | 65.4518 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1513.4745 | -1.7472 | -0.7588 | 47.2253 | 139.6079 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7480.5681 | 131.6368 | -23.452 | 1503.8271 | 1988.8357 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3778.9939 | -28.7568 | 22.5458 | 263.9749 | 506.4792 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 740.1568 | 0.0842 | -20.1546 | 19.2605 | 65.4518 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3615.6293 | 19.4669 | 32.3197 | 263.9749 | 506.4792 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4442.2661 | 81.1046 | 22.8932 | 422.8995 | 711.5951 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 730.3143 | -0.0825 | -20.1651 | 19.2605 | 65.4518 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3627.165 | -2.7381 | -0.1425 | 263.9749 | 506.4792 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 312.4512 | -30.5685 | -51.2129 | 420000 |
| Bottom | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 381.2584 | 39.1283 | -219.0577 | 420000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 312.4512 | -51.2129 | -38.3526 | 236.0428 | 478.5472 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 381.2584 | -219.0577 | -38.3526 | 236.0428 | 478.5472 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 1012.9964 | -34.9624 | 261.2731 | 420000 |
| Bottom | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 1059.4452 | 2.5935 | -362.3349 | 420000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1012.9964 | 261.2731 | -211.3766 | 492.0224 | 734.5267 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1059.4452 | -362.3349 | -211.3766 | 492.0224 | 734.5267 |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Concrete Frame Design

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C1 | 32 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.685 |
| Bottom | 24632 | 5.03 | 0.688 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9141.13 | 286.7877 | -1.4878 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 9185.4374 | 288.1778 | 0.7534 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7596 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7596 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.7917 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.7917 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C2 | 33 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.698 |
| Bottom | 19706 | 4.02 | 0.701 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8247.5712 | 258.7538 | 2.8794 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8291.8786 | 260.1439 | 5.2193 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.802 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.802 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5329 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.5329 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C3 | 34 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.68 |
| Bottom | 24632 | 5.03 | 0.683 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9075.5511 | -284.7303 | -0.7037 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 9119.8585 | 286.1204 | 0.5072 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4693 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4693 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.7698 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.7698 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C4 | 35 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.682 |
| Bottom | 19706 | 4.02 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8065.5614 | 253.0435 | 2.9049 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8109.8688 | 254.4336 | 3.7419 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.765 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.765 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5755 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.5755 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C5 | 36 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.669 |
| Bottom | 24632 | 5.03 | 0.673 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8936.522 | 280.3685 | -1.6953 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8980.8294 | 281.7586 | -1.3941 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8603 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8603 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.1812 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.1812 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C6 | 37 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.712 |
| Bottom | 19706 | 4.02 | 0.715 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8406.3608 | 263.7356 | 0.584 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8450.6682 | 265.1256 | -1.1837 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2528 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.2528 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.598 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.598 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C7 | 38 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.679 |
| Bottom | 24632 | 5.03 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9108.1548 | 17.7723 | 285.7532 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 9085.1383 | 285.0311 | -2.5062 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.311 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.311 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.1366 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.1366 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C8 | 39 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.724 |
| Bottom | 19706 | 4.02 | 0.728 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8558.3778 | -268.5048 | -1.3284 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8602.6852 | 269.8949 | -0.9831 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.912 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.912 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.2115 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.2115 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C9 | 40 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.746 |
| Bottom | 17242 | 2.87 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9252.3434 | 259.4357 | -50.0122 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 9342.7667 | 261.9712 | -95.9531 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.0781 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 23.0781 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.7211 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.7211 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C10 | 41 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.76 |
| Bottom | 17242 | 2.87 | 0.759 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9424.1493 | 264.2531 | 49.5075 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 9514.5726 | 266.7886 | -98.8357 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 24.1856 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 24.1856 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.4663 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.4663 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C11 | 42 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.731 |
| Bottom | 17242 | 2.87 | 0.731 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9080.027 | -254.604 | -50.5719 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 9134.281 | 256.1252 | -80.8829 | 1608 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.4174 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 23.4174 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.6983 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.6983 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C12 | 43 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.737 |
| Bottom | 17242 | 2.87 | 0.737 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9155.1199 | 256.7096 | -51.0295 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 9209.3739 | 258.2308 | -83.029 | 1608 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.8583 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 23.8583 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.4607 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.4607 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C1 | 231 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.649 |
| Bottom | 24632 | 5.03 | 0.653 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8672.0583 | 275.1933 | -5.4028 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8718.3497 | 276.6623 | 1.5092 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6955 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6955 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2592 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.2592 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C2 | 232 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.692 |
| Bottom | 19706 | 4.02 | 0.696 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8171.7416 | 259.3166 | 2.007 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8218.0329 | 260.7856 | 1.6368 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7984 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.7984 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.378 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.378 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C3 | 233 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.64 |
| Bottom | 24632 | 5.03 | 0.645 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8553.5148 | -271.4315 | 4.5258 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8599.8061 | 272.9005 | 0.5935 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7941 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.7941 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6975 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6975 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C4 | 234 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.676 |
| Bottom | 19706 | 4.02 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7989.7318 | -253.5408 | 3.0679 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8036.0231 | 255.0098 | 2.7142 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7567 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.7567 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4247 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.4247 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C5 | 235 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.641 |
| Bottom | 24632 | 5.03 | 0.643 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8558.4098 | 271.5869 | -3.5677 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8589.2707 | 272.5662 | 6.5716 | 840 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6327 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.6327 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2552 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2552 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C6 | 236 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.683 |
| Bottom | 19706 | 4.02 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8065.894 | 255.9577 | -0.0949 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8112.1853 | 257.4267 | -3.6842 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0685 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0685 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1713 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.1713 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C7 | 237 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 24632 | 5.03 | 0.65 |
| Bottom | 24632 | 5.03 | 0.65 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8691.2824 | 275.8034 | -9.6094 | 4200 | 202] 1.5 [DL + RSX] |
| Bottom | 8768.4346 | -40.8664 | 278.2517 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.581 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.581 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.554 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.554 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C8 | 238 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19706 | 4.02 | 0.694 |
| Bottom | 19706 | 4.02 | 0.698 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8196.991 | 260.1178 | -1.1796 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 8243.2824 | 261.5868 | 1.5077 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7099 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.7099 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.197 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.197 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C9 | 239 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.732 |
| Bottom | 17242 | 2.87 | 0.734 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9052.7129 | -257.097 | -36.9124 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 9109.3962 | 258.7069 | 54.8449 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5798 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.5798 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.0524 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.0524 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C10 | 240 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.746 |
| Bottom | 17242 | 2.87 | 0.748 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9224.8443 | 261.9856 | -36.8359 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 9281.5276 | 263.5954 | -54.2674 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.2028 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.2028 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.6964 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.6964 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C11 | 241 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.718 |
| Bottom | 17242 | 2.87 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8883.4322 | -252.2895 | -37.2938 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 8940.1155 | 253.8993 | 56.3016 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.9484 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.9484 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.0844 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.0844 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C12 | 242 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 59 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17242 | 2.87 | 0.724 |
| Bottom | 17242 | 2.87 | 0.726 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8959.3358 | -254.4451 | -37.345 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 9016.0191 | 256.0549 | -55.2374 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.9854 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.9854 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.2093 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.2093 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C1 | 474 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.747 |
| Bottom | 17672 | 3.61 | 0.747 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8363.326 | -249.5059 | -0.2907 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 8399.1467 | 250.5745 | 10.8953 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0926 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.0926 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.192 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.192 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C2 | 475 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.789 |
| Bottom | 13745 | 2.81 | 0.791 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7874.6664 | 234.9275 | -0.9095 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7910.4871 | 235.9962 | -7.8359 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6855 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6855 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9065 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.9065 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C3 | 476 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.736 |
| Bottom | 17672 | 3.61 | 0.737 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8243.999 | -245.946 | 0.2118 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 8294.837 | -14.9605 | 247.4626 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1822 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1822 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.93 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.93 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C4 | 477 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.772 |
| Bottom | 13745 | 2.81 | 0.773 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7696.2278 | 229.6041 | 0.0803 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7732.0485 | 230.6728 | 8.3005 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2116 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2116 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8754 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8754 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C5 | 478 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.735 |
| Bottom | 17672 | 3.61 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8229.3907 | 245.5102 | 0.2257 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 8265.2114 | 246.5788 | 10.329 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3534 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.3534 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6635 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6635 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C6 | 479 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.778 |
| Bottom | 13745 | 2.81 | 0.78 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7760.0889 | 231.5093 | -0.415 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7795.9096 | 232.578 | -5.1286 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8494 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8494 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.221 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.221 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C7 | 480 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 17672 | 3.61 | 0.751 |
| Bottom | 17672 | 3.61 | 0.751 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8411.0364 | -0.9902 | -250.9293 | 3250 | 202] 1.5 [DL + RSX] |
| Bottom | 8470.7376 | 21.2491 | 252.7103 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6726 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.6726 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4575 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.4575 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C8 | 481 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.792 |
| Bottom | 13745 | 2.81 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7893.551 | 235.4909 | 0.075 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7929.3717 | 236.5596 | 1.7527 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6823 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6823 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6211 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.6211 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C9 | 482 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.778 |
| Bottom | 13745 | 2.29 | 0.78 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8764.6518 | -232.2633 | -20.7805 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 8808.5139 | 233.4256 | 31.1955 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.6007 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.6007 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.0989 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.0989 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C10 | 483 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.793 |
| Bottom | 13745 | 2.29 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8932.9089 | -236.7221 | -21.5454 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 8976.771 | 237.8844 | -27.9463 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.3089 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.3089 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.6814 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.6814 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C11 | 484 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.764 |
| Bottom | 13745 | 2.29 | 0.767 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8617.5542 | -228.3652 | -21.6632 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 8661.4162 | 229.5275 | 31.416 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.6453 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.6453 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.4676 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.4676 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C12 | 485 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.77 |
| Bottom | 13745 | 2.29 | 0.773 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8680.7347 | -230.0395 | -21.9714 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 8724.5967 | 231.2018 | -28.5184 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.2832 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.2832 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.6618 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.6618 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C1 | 701 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.762 |
| Bottom | 15709 | 3.21 | 0.764 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8068.839 | -239.1066 | -0.3692 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 8103.5575 | 240.1354 | 6.6207 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8364 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8364 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1673 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.1673 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C2 | 702 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.786 |
| Bottom | 12763 | 2.6 | 0.789 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7601.3238 | -225.2526 | 0.2297 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7636.0423 | 226.2814 | -1.4528 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.512 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.512 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.9313 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.9313 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C3 | 703 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.751 |
| Bottom | 15709 | 3.21 | 0.752 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7949.349 | -235.5657 | -0.8528 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7984.0675 | 236.5945 | -8.3177 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7544 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7544 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.036 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.036 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C4 | 704 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.767 |
| Bottom | 12763 | 2.6 | 0.771 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7426.1934 | -220.0629 | -1.7606 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7460.9119 | 221.0917 | -1.9406 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6972 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.6972 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5416 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.5416 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C5 | 705 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.749 |
| Bottom | 15709 | 3.21 | 0.751 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7933.4279 | -235.0939 | -0.4705 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7968.1464 | 236.1227 | 8.0437 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5782 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.5782 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5153 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5153 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C6 | 706 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.775 |
| Bottom | 12763 | 2.6 | 0.777 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7492.7986 | 222.0366 | 0.7541 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7527.5171 | 223.0654 | 3.1697 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5296 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5296 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6726 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.6726 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C7 | 707 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.766 |
| Bottom | 15709 | 3.21 | 0.766 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8116.3423 | -1.7924 | -240.5143 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 8162.6337 | 20.1831 | 241.886 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.3002 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.3002 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.679 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.679 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C8 | 708 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.788 |
| Bottom | 12763 | 2.6 | 0.791 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7619.4481 | -225.7896 | -0.876 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7654.1666 | 226.8185 | -0.0024 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5852 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.5852 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.1113 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.1113 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C9 | 709 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.774 |
| Bottom | 12763 | 2.13 | 0.776 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8477.7652 | -222.9652 | -12.3314 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8520.2776 | 224.0833 | 24.5859 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.4864 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.4864 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.6757 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.6757 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C10 | 710 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.789 |
| Bottom | 12763 | 2.13 | 0.792 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8638.2597 | -227.1862 | -14.3355 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8680.7722 | 228.3043 | -20.2322 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.0471 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.0471 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.0021 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 8.0021 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C11 | 711 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.761 |
| Bottom | 12763 | 2.13 | 0.763 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8329.1688 | -219.0571 | -13.3555 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8371.6812 | 220.1752 | 24.2841 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.6467 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.6467 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.7807 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.7807 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C12 | 712 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.765 |
| Bottom | 12763 | 2.13 | 0.768 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8384.5656 | 220.5141 | -15.2104 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8427.0781 | 221.6322 | -22.8003 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.9484 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.9484 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.6432 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.6432 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C1 | 928 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.697 |
| Bottom | 9818 | 2 | 0.699 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6100.7993 | -180.787 | 0.2011 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6145.7797 | 182.1199 | -9.0035 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.0617 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.0617 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7108 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7108 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C2 | 929 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.652 |
| Bottom | 9818 | 2 | 0.654 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5708.024 | -169.1478 | 1.9969 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5719.5968 | -169.4907 | 0.7234 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.9905 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.9905 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.5238 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.5238 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C3 | 930 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.683 |
| Bottom | 9818 | 2 | 0.687 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5978.8442 | -177.1731 | -1.7957 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6036.2934 | 178.8755 | 7.6269 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.4644 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.4644 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6269 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6269 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C4 | 931 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.635 |
| Bottom | 9818 | 2 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5563.0522 | -164.8518 | -3.505 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5574.6251 | -165.1947 | -2.5264 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.4919 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.4919 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.3718 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.3718 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C5 | 932 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.681 |
| Bottom | 9818 | 2 | 0.683 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5957.1698 | -176.5308 | -0.0928 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6007.9349 | -9.894 | 178.0351 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.4887 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.4887 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4754 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4754 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C6 | 933 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.642 |
| Bottom | 9818 | 2 | 0.647 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5632.271 | -166.903 | 3.8246 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5666.9895 | 167.9318 | 3.1409 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1064 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.1064 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9769 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.9769 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C7 | 934 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.693 |
| Bottom | 9818 | 2 | 0.696 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6098.6598 | -10.0356 | -180.7236 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6133.3783 | -13.0906 | 181.7524 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.006 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.006 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3431 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3431 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C8 | 935 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.654 |
| Bottom | 9818 | 2 | 0.655 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5732.5783 | -169.8754 | -2.5626 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5744.1512 | 170.2183 | -5.2131 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.6562 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.6562 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 28.3604 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 28.3604 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C9 | 936 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.629 |
| Bottom | 9818 | 1.64 | 0.633 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6308.5834 | -165.9157 | -11.3323 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6351.0958 | 167.0338 | 13.9852 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.0689 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.0689 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.5495 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.5495 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C10 | 937 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.637 |
| Bottom | 9818 | 1.64 | 0.642 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6396.4982 | -168.2279 | -12.4452 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6439.0107 | 169.346 | -11.361 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.9262 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.9262 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.2014 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.2014 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C11 | 938 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.611 |
| Bottom | 9818 | 1.64 | 0.615 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6135.7047 | -161.369 | -11.9732 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6178.2172 | -162.4871 | -13.6146 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.7163 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.7163 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.7192 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.7192 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C12 | 939 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.609 |
| Bottom | 9818 | 1.64 | 0.613 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6113.7371 | -160.7913 | -12.7179 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6156.2495 | 161.9094 | -12.2225 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9475 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9475 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.4087 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.4087 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C1 | 1155 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.729 |
| Bottom | 9818 | 2 | 0.731 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6382.9538 | -2.9468 | -189.1482 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6407.8165 | 189.885 | 4.6081 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.806 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.806 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6184 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6184 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C2 | 1156 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.682 |
| Bottom | 9818 | 2 | 0.685 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5974.6108 | -177.0476 | 2.8542 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6009.3293 | 178.0765 | -4.43 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.761 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.761 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1925 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.1925 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C3 | 1157 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.716 |
| Bottom | 9818 | 2 | 0.718 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6272.8425 | -2.3065 | -185.8852 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6307.561 | 8.1002 | 186.9141 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7932 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.7932 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3791 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.3791 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C4 | 1158 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.665 |
| Bottom | 9818 | 2 | 0.669 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5825.1282 | -172.618 | -3.6539 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5859.8467 | 173.6468 | 1.8012 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1303 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.1303 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6995 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.6995 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C5 | 1159 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.712 |
| Bottom | 9818 | 2 | 0.716 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6242.4521 | 4.0491 | -184.9847 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6277.1706 | -3.2132 | 186.0135 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4615 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4615 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5064 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5064 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C6 | 1160 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.673 |
| Bottom | 9818 | 2 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5894.9428 | -174.6868 | 2.8119 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5929.6613 | 175.7156 | 6.2934 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6267 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6267 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2259 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2259 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C7 | 1161 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.727 |
| Bottom | 9818 | 2 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6376.4598 | -6.4616 | -188.9558 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6411.1783 | -11.1074 | -189.9846 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.4488 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.4488 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6286 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6286 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C8 | 1162 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 2 | 0.685 |
| Bottom | 9818 | 2 | 0.688 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5996.7183 | -177.7028 | -1.629 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6031.4368 | 178.7316 | 2.8919 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5636 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.5636 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 25.2981 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 25.2981 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C9 | 1163 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.661 |
| Bottom | 9818 | 1.64 | 0.665 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6624.0063 | -174.2114 | -6.0269 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6666.5187 | 175.3294 | 7.4806 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5466 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.5466 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.8683 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.8683 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C10 | 1164 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.671 |
| Bottom | 9818 | 1.64 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6722.0204 | 176.7891 | 6.8308 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6764.5329 | -177.9072 | -2.5579 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.5526 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.5526 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 14.7154 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 14.7154 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C11 | 1165 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.645 |
| Bottom | 9818 | 1.64 | 0.648 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6456.1636 | -169.7971 | -4.6872 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6498.676 | 170.9152 | 7.8857 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.5161 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.5161 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.8961 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.8961 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C12 | 1166 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9818 | 1.64 | 0.643 |
| Bottom | 9818 | 1.64 | 0.648 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6445.7658 | -169.5236 | 9.476 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6488.2783 | -170.6417 | -5.4505 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.9092 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.9092 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.1896 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.1896 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C1 | 1382 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.709 |
| Bottom | 11782 | 2.4 | 0.712 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6657.8618 | 5.9503 | 197.2946 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6671.3907 | 197.6955 | 2.4004 | 630 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5456 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.5456 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2879 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.2879 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C2 | 1383 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.688 |
| Bottom | 10800 | 2.2 | 0.692 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6242.72 | -184.9926 | -2.0734 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6277.4385 | 186.0214 | -3.4343 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.111 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.111 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.1343 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.1343 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C3 | 1384 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.697 |
| Bottom | 11782 | 2.4 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6547.22 | -5.6209 | -194.016 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6581.9385 | 9.5339 | 195.0448 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.473 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.473 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1041 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1041 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C4 | 1385 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.671 |
| Bottom | 10800 | 2.2 | 0.675 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6088.7162 | -180.429 | 1.4169 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6123.4347 | 181.4578 | 0.8512 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2131 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2131 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.5357 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.5357 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C5 | 1386 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.694 |
| Bottom | 11782 | 2.4 | 0.698 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6514.9624 | -5.4557 | -193.0601 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6549.6809 | -5.0893 | 194.0889 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0117 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.0117 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4808 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4808 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C6 | 1387 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.679 |
| Bottom | 10800 | 2.2 | 0.681 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6158.9741 | -182.5109 | -1.5447 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6193.6926 | 183.5398 | 6.4782 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5436 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.5436 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1448 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.1448 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C7 | 1388 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.709 |
| Bottom | 11782 | 2.4 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6658.6435 | -5.2595 | -197.3178 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6693.362 | -12.6266 | 198.3466 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2657 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.2657 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6358 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6358 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C8 | 1389 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.69 |
| Bottom | 10800 | 2.2 | 0.694 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6262.9368 | -185.5917 | 1.9766 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6297.6553 | 186.6205 | 1.6369 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8185 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.8185 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.5916 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.5916 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C9 | 1390 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.672 |
| Bottom | 10800 | 1.8 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6939.1001 | 182.4983 | -8.0137 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6981.6125 | 183.6164 | 7.9864 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3748 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.3748 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.1193 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.1193 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C10 | 1391 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.682 |
| Bottom | 10800 | 1.8 | 0.687 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7047.6195 | -185.3524 | -8.7987 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7090.1319 | 186.4705 | -3.3233 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.9778 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.9778 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.7496 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.7496 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C11 | 1392 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.656 |
| Bottom | 10800 | 1.8 | 0.66 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6775.8227 | 178.2041 | -8.1522 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6818.3351 | 179.3222 | 8.1947 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7532 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.7532 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.2198 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.2198 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C12 | 1393 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.656 |
| Bottom | 10800 | 1.8 | 0.66 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6776.9923 | -178.2349 | -8.3335 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6819.5047 | 179.353 | -6.3853 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.0793 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.0793 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.382 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 8.382 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C1 | 1609 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.739 |
| Bottom | 11782 | 2.4 | 0.741 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6935.8195 | -4.1789 | -205.5315 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6970.538 | 9.844 | -206.5603 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1899 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1899 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9625 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9625 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C2 | 1610 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.718 |
| Bottom | 10800 | 2.2 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6512.3371 | -192.9823 | -0.666 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6547.0556 | -194.0111 | -2.4095 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3553 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3553 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1119 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.1119 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C3 | 1611 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.728 |
| Bottom | 11782 | 2.4 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6824.6893 | -3.8669 | -202.2383 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6859.4078 | 9.2311 | 203.2671 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1283 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1283 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.738 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.738 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C4 | 1612 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.701 |
| Bottom | 10800 | 2.2 | 0.705 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6353.8687 | -188.2863 | -0.0452 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6388.5872 | 189.3151 | -0.2794 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4601 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4601 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.5068 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.5068 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C5 | 1613 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.724 |
| Bottom | 11782 | 2.4 | 0.727 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6785.9698 | 201.0909 | -2.5175 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6825.5079 | -5.0286 | 202.2626 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6104 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6104 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1283 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1283 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C6 | 1614 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.709 |
| Bottom | 10800 | 2.2 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6424.3223 | -190.3741 | 0.0371 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6459.0408 | 191.4029 | 5.9006 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6865 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6865 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1689 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1689 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C7 | 1615 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.74 |
| Bottom | 11782 | 2.4 | 0.741 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6944.7632 | -5.7429 | -205.7965 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6979.4817 | -13.1283 | 206.8253 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5593 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.5593 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.649 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.649 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C8 | 1616 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 2.2 | 0.721 |
| Bottom | 10800 | 2.2 | 0.724 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6531.2895 | -193.5439 | 0.3847 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6566.008 | 194.5727 | 0.9121 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.3409 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.3409 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 25.0164 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 25.0164 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C9 | 1617 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.702 |
| Bottom | 10800 | 1.8 | 0.706 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7253.309 | -190.762 | -6.15 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7295.8214 | 191.8801 | 7.9896 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.0924 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.0924 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.0474 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.0474 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C10 | 1618 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.714 |
| Bottom | 10800 | 1.8 | 0.718 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7372.5638 | 193.8984 | 8.5506 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7415.0763 | 195.0165 | -3.5787 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.2785 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.2785 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.3681 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.3681 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C11 | 1619 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.687 |
| Bottom | 10800 | 1.8 | 0.691 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7094.0227 | -186.5728 | -6.4365 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7136.5351 | 187.6909 | 8.3758 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.3855 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.3855 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.168 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.168 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C12 | 1620 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10800 | 1.8 | 0.688 |
| Bottom | 10800 | 1.8 | 0.692 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7106.7582 | -186.9077 | -8.6636 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7149.2706 | 188.0258 | -6.4862 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.6244 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.6244 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.1321 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 8.1321 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C1 | 1836 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.722 |
| Bottom | 13745 | 2.81 | 0.724 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7216.8941 | -4.0878 | -213.8606 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7251.6126 | 10.8385 | 214.8895 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7714 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7714 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5267 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.5267 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C2 | 1837 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.724 |
| Bottom | 11782 | 2.4 | 0.727 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6783.4091 | -201.015 | 0.2837 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6818.1276 | 202.0438 | -2.6744 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4304 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4304 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.4683 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.4683 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C3 | 1838 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.711 |
| Bottom | 13745 | 2.81 | 0.713 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7105.3245 | -3.8321 | -210.5545 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7140.043 | 10.0971 | 211.5833 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7106 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7106 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2624 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.2624 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C4 | 1839 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.707 |
| Bottom | 11782 | 2.4 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6620.5451 | 196.1888 | -0.9944 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6655.2636 | 197.2176 | -0.1216 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5313 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5313 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8872 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.8872 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C5 | 1840 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.708 |
| Bottom | 13745 | 2.81 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7068.1885 | -209.454 | -1.8324 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7104.7636 | -6.0338 | 210.5378 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2109 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.2109 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7478 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7478 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C6 | 1841 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.714 |
| Bottom | 11782 | 2.4 | 0.717 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6690.8508 | 198.2722 | 1.0863 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6725.5693 | 199.301 | 4.4485 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.931 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.931 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6279 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.6279 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C7 | 1842 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.724 |
| Bottom | 13745 | 2.81 | 0.725 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7234.8905 | -4.9358 | -214.3939 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7258.0361 | -10.2244 | 215.0798 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9276 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9276 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7165 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7165 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C8 | 1843 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.726 |
| Bottom | 11782 | 2.4 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6801.5998 | 201.5541 | -0.5309 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6836.3183 | 202.5829 | 1.3917 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8078 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8078 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 23.8254 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 23.8254 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C9 | 1844 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.712 |
| Bottom | 11782 | 1.96 | 0.715 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7566.0351 | 198.9867 | -5.6647 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7608.5476 | 200.1048 | 9.0813 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.3523 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.3523 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.6912 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.6912 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C10 | 1845 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.724 |
| Bottom | 11782 | 1.96 | 0.728 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7696.1149 | -202.4078 | -8.1461 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7738.6274 | 203.5259 | -4.8491 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.1441 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.1441 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.6048 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.6048 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C11 | 1846 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.697 |
| Bottom | 11782 | 1.96 | 0.701 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7410.1806 | -194.8877 | -6.0774 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7452.693 | 196.0058 | 9.538 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.6561 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.6561 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.8101 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.8101 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C12 | 1847 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.699 |
| Bottom | 11782 | 1.96 | 0.703 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7434.3614 | 195.5237 | -8.0856 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7476.8739 | 196.6418 | -7.6126 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.6765 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.6765 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.5369 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.5369 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C1 | 2063 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.751 |
| Bottom | 13745 | 2.81 | 0.752 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7500.9876 | -4.0737 | -222.2793 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7526.0926 | 223.0232 | 7.9586 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5742 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5742 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3032 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.3032 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C2 | 2064 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.753 |
| Bottom | 11782 | 2.4 | 0.756 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7055.5579 | 209.0797 | 0.4888 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7090.2764 | 210.1085 | -3.0114 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.825 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.825 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.9631 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.9631 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C3 | 2065 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.74 |
| Bottom | 13745 | 2.81 | 0.741 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7389.0279 | -3.9119 | -218.9615 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7423.7464 | 11.7085 | 219.9904 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5194 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5194 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.996 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.996 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C4 | 2066 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.735 |
| Bottom | 11782 | 2.4 | 0.739 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6888.4018 | 204.1263 | 1.1887 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6923.1203 | 205.1551 | 0.1364 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9284 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9284 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4184 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.4184 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C5 | 2067 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.737 |
| Bottom | 13745 | 2.81 | 0.738 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7353.4803 | 217.9081 | -1.6441 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7387.4215 | -7.8151 | 218.9139 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.016 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.016 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5565 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5565 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C6 | 2068 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.743 |
| Bottom | 11782 | 2.4 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6958.1056 | -206.1919 | 1.4121 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6992.8241 | 207.2207 | 3.1465 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1134 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1134 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2223 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.2223 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C7 | 2069 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.81 | 0.754 |
| Bottom | 13745 | 2.81 | 0.754 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7528.8793 | -4.5024 | -223.1058 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7563.5978 | 15.2353 | 224.1346 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4707 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.4707 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6811 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6811 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C8 | 2070 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 2.4 | 0.755 |
| Bottom | 11782 | 2.4 | 0.758 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7073.3799 | 209.6078 | -0.7407 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7108.0984 | 210.6367 | 1.9256 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5238 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5238 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.6902 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.6902 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C9 | 2071 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.741 |
| Bottom | 11782 | 1.96 | 0.744 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7875.7795 | -207.133 | -5.817 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7918.292 | 208.2511 | 11.5982 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.6691 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.6691 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.2774 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.2774 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C10 | 2072 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.754 |
| Bottom | 11782 | 1.96 | 0.758 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8016.5785 | 210.836 | -7.9789 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8059.0909 | 211.9541 | -7.556 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.0134 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.0134 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.7402 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 9.7402 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C11 | 2073 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.726 |
| Bottom | 11782 | 1.96 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7722.8334 | -203.1105 | -6.4553 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7765.3458 | 204.2286 | 12.0992 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.943 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.943 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.4004 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.4004 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C12 | 2074 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11782 | 1.96 | 0.73 |
| Bottom | 11782 | 1.96 | 0.733 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7758.1568 | -204.0395 | -8.2144 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7800.6692 | 205.1576 | -10.1474 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.7492 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.7492 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.8561 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 6.8561 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C1 | 2290 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.734 |
| Bottom | 15709 | 3.21 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7778.5585 | -230.5046 | -0.8477 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7813.2769 | 231.5334 | 9.3588 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9072 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9072 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3517 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.3517 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C2 | 2291 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.757 |
| Bottom | 12763 | 2.6 | 0.761 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7328.3482 | -217.1634 | 0.8977 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7363.0667 | -218.1922 | -2.7485 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3634 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.3634 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4587 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.4587 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C3 | 2292 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.724 |
| Bottom | 15709 | 3.21 | 0.725 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7675.7562 | -5.3428 | 227.4582 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7710.4747 | 13.7086 | 228.4871 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9161 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9161 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9756 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9756 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C4 | 2293 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.74 |
| Bottom | 12763 | 2.6 | 0.744 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7157.0723 | -212.0879 | 0.3258 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7191.7908 | 213.1167 | -0.2681 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5214 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.5214 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9588 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9588 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C5 | 2294 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.722 |
| Bottom | 15709 | 3.21 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7641.9148 | 226.4554 | -0.9524 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7676.6333 | 227.4842 | 9.9617 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1841 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.1841 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6927 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6927 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C6 | 2295 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.747 |
| Bottom | 12763 | 2.6 | 0.75 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7225.5918 | -214.1184 | -0.9014 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7260.3103 | 215.1472 | 2.6943 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0463 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0463 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.0457 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.0457 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C7 | 2296 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.738 |
| Bottom | 15709 | 3.21 | 0.738 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7826.6888 | -4.3862 | -231.9309 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7838.2616 | -8.6591 | 232.2738 | 1260 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4923 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.4923 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.513 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.513 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C8 | 2297 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.6 | 0.759 |
| Bottom | 12763 | 2.6 | 0.763 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7346.1328 | -217.6904 | -1.1639 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7380.8513 | 218.7192 | 1.8808 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3459 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.3459 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.4437 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.4437 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C9 | 2298 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.748 |
| Bottom | 12763 | 2.13 | 0.75 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8180.5353 | -215.1481 | -7.6453 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8223.0478 | 216.2662 | 16.1433 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.0597 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.0597 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.8629 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.8629 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C10 | 2299 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.761 |
| Bottom | 12763 | 2.13 | 0.765 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8331.6236 | -219.1217 | -9.5982 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8374.1361 | 220.2398 | -12.2471 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.9887 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.9887 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.8237 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 8.8237 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C11 | 2300 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.734 |
| Bottom | 12763 | 2.13 | 0.737 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8030.0011 | -211.189 | -8.4956 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8072.5136 | 212.3071 | 16.5461 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.3172 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.3172 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.0054 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.0054 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C12 | 2301 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12763 | 2.13 | 0.738 |
| Bottom | 12763 | 2.13 | 0.741 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8075.8669 | -212.3953 | -10.1404 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 8118.3794 | 213.5134 | -14.744 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.8896 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.8896 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.1634 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 6.1634 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C1 | 2539 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.715 |
| Bottom | 7854 | 1.6 | 0.72 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5833.1188 | -172.8548 | -6.0261 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5867.8373 | -173.8836 | -2.9102 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0543 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0543 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2888 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2888 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C2 | 2540 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.643 |
| Bottom | 8836 | 1.8 | 0.647 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5437.8761 | -161.1424 | -2.9017 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5472.5946 | 162.1712 | -1.4092 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2821 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.2821 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.4173 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.4173 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C3 | 2541 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.702 |
| Bottom | 7854 | 1.6 | 0.706 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5734.8539 | 8.9029 | -169.9428 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5745.0767 | 170.2458 | -0.5286 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7453 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.7453 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.5884 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.5884 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C4 | 2542 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.627 |
| Bottom | 8836 | 1.8 | 0.631 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5298.1378 | -157.0015 | 0.4225 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5332.8563 | 158.0303 | -2.3255 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4737 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.4737 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.9247 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.9247 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C5 | 2543 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.698 |
| Bottom | 7854 | 1.6 | 0.703 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5708.8454 | -10.5336 | -169.1721 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5722.9268 | 169.5894 | -1.0989 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2396 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2396 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.3484 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.3484 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C6 | 2544 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.634 |
| Bottom | 8836 | 1.8 | 0.639 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5365.5132 | -158.998 | -2.9222 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5400.2317 | 160.0269 | -1.3478 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1651 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.1651 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.2052 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.2052 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C7 | 2545 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.712 |
| Bottom | 7854 | 1.6 | 0.713 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5824.6843 | -11.0792 | -172.6048 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5801.9623 | 171.9315 | -1.1717 | 630 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2765 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2765 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.6831 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.6831 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C8 | 2546 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.646 |
| Bottom | 8836 | 1.8 | 0.65 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5466.1882 | -161.9814 | 1.9424 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5500.9067 | 163.0102 | 3.8878 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6817 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6817 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 29.615 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 29.615 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C9 | 2547 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.749 |
| Bottom | 7854 | 1.64 | 0.751 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6018.9504 | -158.2984 | -8.2425 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6052.9604 | 159.1929 | 15.4401 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0807 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.0807 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.3494 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.3494 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C10 | 2548 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.76 |
| Bottom | 7854 | 1.64 | 0.763 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6087.3935 | -160.0985 | 1.5202 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 6132.7401 | 161.2911 | -8.96 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 18.3277 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 18.3277 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.383 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.383 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C11 | 2549 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.727 |
| Bottom | 7854 | 1.64 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5829.7648 | -153.3228 | -4.451 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 5875.1114 | 154.5154 | 12.9348 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.1797 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.1797 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.3157 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.3157 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C12 | 2550 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.722 |
| Bottom | 7854 | 1.64 | 0.725 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5793.9884 | -152.3819 | 3.8471 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 5839.335 | 153.5745 | -13.8581 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.5219 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.5219 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.6063 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.6063 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C1 | 2824 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.335 |
| Bottom | 3770 | 0.77 | 0.342 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2314.3377 | -68.5815 | 5.0622 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2355.4415 | 69.7996 | 2.4097 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.5093 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.5093 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3633 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.3633 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C2 | 2825 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.293 |
| Bottom | 3770 | 0.77 | 0.3 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2030.1574 | -60.1603 | 7.6818 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2064.8759 | 61.1892 | -0.7754 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.0727 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.0727 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.0752 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.0752 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C3 | 2826 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.327 |
| Bottom | 3770 | 0.77 | 0.335 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2266.6756 | -67.1692 | 7.7216 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2307.2426 | 68.3713 | -3.591 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.8243 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.8243 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2183 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2183 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C4 | 2827 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.282 |
| Bottom | 3770 | 0.77 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1953.6021 | -57.8917 | 7.1124 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1988.3206 | 2.1284 | -58.9206 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.0987 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.0987 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.2891 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.2891 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C5 | 2828 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.326 |
| Bottom | 3770 | 0.77 | 0.332 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2260.5212 | -66.9868 | 40.8792 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2295.2397 | -4.9571 | 68.0156 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.4859 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.4859 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8648 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.8648 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C6 | 2829 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.289 |
| Bottom | 3770 | 0.77 | 0.295 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2000.7077 | -59.2876 | -7.3885 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2035.4262 | -2.7069 | 60.3165 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2201 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.2201 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.4111 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.4111 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C7 | 2830 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.334 |
| Bottom | 3770 | 0.77 | 0.34 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2283.5012 | -67.6678 | 75.7272 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2341.3653 | 69.3825 | -65.641 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 23.1411 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 23.1411 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4593 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.4593 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C8 | 2831 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.294 |
| Bottom | 3770 | 0.77 | 0.302 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2036.5158 | -60.3488 | -8.1547 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2071.2343 | -61.3776 | -0.0501 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.7807 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.7807 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 25.5602 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 25.5602 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C9 | 2832 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.383 |
| Bottom | 3801 | 0.79 | 0.387 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2589.0956 | -68.0932 | -5.3475 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2623.1056 | 68.9877 | 6.2837 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.5378 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.5378 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.8312 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.8312 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C10 | 2833 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.412 |
| Bottom | 3801 | 0.79 | 0.417 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2792.3207 | 73.438 | 7.1695 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2814.994 | 74.0343 | 2.1624 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.1631 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.1631 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 20.4125 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 20.4125 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C11 | 2834 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.341 |
| Bottom | 3801 | 0.79 | 0.347 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2308.6818 | -60.7183 | -5.5933 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2342.6918 | 61.6128 | 1.8414 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.938 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.938 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.2364 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.2364 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C12 | 2835 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.339 |
| Bottom | 3801 | 0.79 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2297.2094 | 60.4166 | 7.1784 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2331.2194 | 61.3111 | 0.1941 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.4076 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.4076 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.0157 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.0157 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C1 | 3110 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.385 |
| Bottom | 3770 | 0.77 | 0.388 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2646.9337 | -78.4375 | -2.1529 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2686.713 | 79.6163 | -8.1751 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.386 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.386 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1004 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1004 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C2 | 3111 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.342 |
| Bottom | 3770 | 0.77 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2350.4546 | -69.6518 | 0.8971 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2385.1731 | 70.6806 | -4.0207 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0938 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0938 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.4525 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.4525 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C3 | 3112 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.377 |
| Bottom | 3770 | 0.77 | 0.38 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2590.1873 | -76.7559 | 1.1297 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2630.4337 | 77.9485 | 6.9831 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.3174 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.3174 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6406 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6406 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C4 | 3113 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.329 |
| Bottom | 3770 | 0.77 | 0.335 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2265.4323 | -67.1323 | -1.4982 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2300.1508 | 68.1611 | 1.1854 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6661 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6661 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.2434 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.2434 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C5 | 3114 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.373 |
| Bottom | 3770 | 0.77 | 0.38 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2569.3611 | -76.1387 | -2.7872 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2617.057 | -4.3172 | 77.5521 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.7804 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.7804 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5165 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.5165 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C6 | 3115 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.337 |
| Bottom | 3770 | 0.77 | 0.339 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2312.3658 | -68.5231 | -0.1984 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2347.0843 | 69.5519 | -6.9236 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9261 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.9261 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.0498 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.0498 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C7 | 3116 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.383 |
| Bottom | 3770 | 0.77 | 0.387 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2607.7293 | 77.2757 | 94.6251 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2665.5935 | 78.9904 | -73.6277 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.1093 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.1093 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.0677 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.0677 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C8 | 3117 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.342 |
| Bottom | 3770 | 0.77 | 0.347 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2354.5935 | -69.7745 | 2.1372 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2389.312 | 70.8033 | 1.4992 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.4846 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.4846 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 27.3509 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 27.3509 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C9 | 3118 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.423 |
| Bottom | 3801 | 0.79 | 0.429 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2865.3169 | -75.3578 | -5.5267 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2899.3268 | 76.2523 | 3.9292 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.1243 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.1243 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.5096 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.5096 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C10 | 3119 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.452 |
| Bottom | 3801 | 0.79 | 0.455 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3054.2635 | -80.3271 | 5.4396 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3076.9368 | 80.9234 | 4.7415 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 19.4458 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 19.4458 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.1492 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.1492 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C11 | 3120 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.385 |
| Bottom | 3801 | 0.79 | 0.392 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2604.1695 | 68.4897 | -5.5036 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2638.1795 | 69.3841 | 0.1557 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.5368 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.5368 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.4172 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.4172 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C12 | 3121 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.383 |
| Bottom | 3801 | 0.79 | 0.389 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2594.4189 | -68.2332 | 5.9822 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2628.4288 | 69.1277 | 4.2595 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.3718 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.3718 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.6612 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.6612 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C1 | 3396 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.432 |
| Bottom | 3770 | 0.77 | 0.436 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2978.8136 | -88.2722 | -3.7866 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3017.5611 | 89.4204 | -8.7892 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.4084 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.4084 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.028 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.028 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C2 | 3397 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.388 |
| Bottom | 3770 | 0.77 | 0.393 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2668.1039 | -79.0648 | -1.4359 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2702.8224 | -80.0936 | -0.9539 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8087 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8087 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.0592 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.0592 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C3 | 3398 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.423 |
| Bottom | 3770 | 0.77 | 0.427 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2913.6267 | -86.3405 | 2.2801 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2953.961 | 87.5357 | 7.7169 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.104 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.104 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3959 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3959 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C4 | 3399 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.375 |
| Bottom | 3770 | 0.77 | 0.38 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2575.3288 | -76.3156 | 0.6622 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2610.0473 | 77.3444 | -1.6456 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1651 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.1651 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.2158 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.2158 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C5 | 3400 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.42 |
| Bottom | 3770 | 0.77 | 0.426 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2892.5491 | -85.7159 | -3.7171 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2939.3316 | -4.2329 | 87.1022 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2445 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.2445 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.27 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.27 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C6 | 3401 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.381 |
| Bottom | 3770 | 0.77 | 0.385 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2622.5248 | -77.7142 | -1.39 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2657.2433 | 78.743 | -4.1415 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9997 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.9997 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.2757 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.2757 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C7 | 3402 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.428 |
| Bottom | 3770 | 0.77 | 0.434 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2933.2858 | 86.923 | 93.6644 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2991.15 | 88.6377 | -76.681 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.5721 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.5721 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.7124 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.7124 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C8 | 3403 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.388 |
| Bottom | 3770 | 0.77 | 0.393 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2670.8695 | -79.1468 | 2.2789 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2705.588 | 80.1756 | -1.6507 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.3231 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.3231 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 28.3142 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 28.3142 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C9 | 3404 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.465 |
| Bottom | 3801 | 0.79 | 0.471 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3145.9645 | -82.7389 | -7.4049 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3179.9744 | 83.6333 | 4.2414 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.56 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.56 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.2854 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.2854 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C10 | 3405 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.49 |
| Bottom | 3801 | 0.79 | 0.495 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3321.8107 | 87.3636 | 7.9761 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3344.484 | 87.9599 | 4.082 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.9454 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 15.9454 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 17.0138 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 17.0138 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C11 | 3406 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.428 |
| Bottom | 3801 | 0.79 | 0.435 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2900.8733 | -76.293 | -7.1207 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2934.8832 | 77.1874 | 0.9529 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.0488 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.0488 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.024 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.024 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C12 | 3407 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.427 |
| Bottom | 3801 | 0.79 | 0.434 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2893.2231 | -76.0918 | 8.6136 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2927.2331 | 76.9862 | 2.7511 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0176 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.0176 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.4675 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.4675 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C1 | 3682 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.481 |
| Bottom | 3770 | 0.77 | 0.484 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3308.6316 | -98.0458 | -2.3768 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3346.6992 | 8.2634 | 99.1739 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8536 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.8536 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.987 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.987 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C2 | 3683 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.434 |
| Bottom | 3770 | 0.77 | 0.44 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2983.6376 | -88.4151 | 0.3691 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3018.3561 | -89.444 | -0.2551 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.2922 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.2922 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.117 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.117 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C3 | 3684 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.471 |
| Bottom | 3770 | 0.77 | 0.474 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3235.5311 | -95.8796 | 1.1737 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3276.3406 | -8.0481 | 97.0889 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4885 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.4885 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3505 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3505 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C4 | 3685 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.42 |
| Bottom | 3770 | 0.77 | 0.424 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2883.7196 | -85.4542 | -0.8187 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2918.4381 | 86.483 | -2.3483 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5596 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.5596 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.361 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.361 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C5 | 3686 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.467 |
| Bottom | 3770 | 0.77 | 0.473 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3214.1726 | -95.2466 | -2.7195 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3260.4392 | -3.9232 | -96.6177 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.601 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.601 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1148 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1148 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C6 | 3687 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.427 |
| Bottom | 3770 | 0.77 | 0.431 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2931.641 | -86.8743 | 0.3634 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2966.3595 | 87.9031 | -3.7136 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.3956 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.3956 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.3684 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.3684 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C7 | 3688 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.475 |
| Bottom | 3770 | 0.77 | 0.48 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3270.308 | -96.9101 | 3.8613 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3316.3067 | 98.2732 | -77.8791 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.7011 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.7011 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6684 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6684 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C8 | 3689 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.435 |
| Bottom | 3770 | 0.77 | 0.439 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2985.9715 | -88.4843 | 0.0579 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3020.69 | 89.5131 | -2.1323 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.4554 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.4554 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 27.5149 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 27.5149 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C9 | 3690 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.507 |
| Bottom | 3801 | 0.79 | 0.513 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3432.585 | -90.277 | -7.2737 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3466.5949 | 91.1714 | 3.9435 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.8352 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.8352 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8588 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.8588 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C10 | 3691 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.531 |
| Bottom | 3801 | 0.79 | 0.536 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3596.2219 | -94.5806 | 7.251 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3618.8952 | 95.1769 | 3.5119 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 16.1409 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 16.1409 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.4173 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.4173 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C11 | 3692 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.473 |
| Bottom | 3801 | 0.79 | 0.48 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3201.0631 | -84.188 | -6.8152 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3235.0731 | 85.0824 | 0.7966 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.2754 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.2754 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5543 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.5543 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C12 | 3693 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3801 | 0.79 | 0.472 |
| Bottom | 3801 | 0.79 | 0.479 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3194.9733 | 84.0278 | 8.1325 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3228.9833 | 84.9223 | 2.3064 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.1107 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.1107 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.9301 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.9301 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C1 | 3968 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.529 |
| Bottom | 3770 | 0.77 | 0.532 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3636.2198 | -107.7533 | -2.0036 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3674.0174 | 8.6124 | -108.8734 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5977 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.5977 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2994 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2994 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C2 | 3969 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.463 |
| Bottom | 4561 | 0.93 | 0.468 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3297.1066 | -97.7043 | 0.7908 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3331.8251 | 98.7331 | -0.3177 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0985 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.0985 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.7298 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.7298 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C3 | 3970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.517 |
| Bottom | 3770 | 0.77 | 0.521 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3555.6675 | -105.3663 | 1.092 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3597.4178 | -8.2331 | 106.6035 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1889 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.1889 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7829 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.7829 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C4 | 3971 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.448 |
| Bottom | 4561 | 0.93 | 0.452 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3190.5846 | 94.5477 | -0.9943 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3225.3031 | 95.5765 | -2.4166 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3042 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.3042 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.0415 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.0415 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C5 | 3972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.514 |
| Bottom | 3770 | 0.77 | 0.52 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3534.0427 | -104.7255 | -2.5445 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3580.2251 | -4.3244 | 106.094 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.3225 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.3225 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.433 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.433 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C6 | 3973 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.455 |
| Bottom | 4561 | 0.93 | 0.459 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3239.6978 | 96.003 | 0.6811 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3274.4163 | 97.0319 | -3.8606 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1722 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1722 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.0174 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.0174 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C7 | 3974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.522 |
| Bottom | 3770 | 0.77 | 0.526 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3593.8442 | -106.4976 | 3.3947 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3640.9527 | -10.5825 | 107.8936 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.2308 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.2308 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1065 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1065 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C8 | 3975 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.464 |
| Bottom | 4561 | 0.93 | 0.468 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3299.8794 | -97.7864 | -0.4688 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3334.5979 | 98.8153 | -1.9567 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.9928 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.9928 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 27.2978 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 27.2978 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C9 | 3976 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.532 |
| Bottom | 4553 | 0.95 | 0.538 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3725.7433 | -97.987 | -7.5753 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3759.7532 | 98.8815 | 4.1225 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.6036 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.6036 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.6517 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.6517 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C10 | 3977 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.554 |
| Bottom | 4553 | 0.95 | 0.559 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3877.8137 | -101.9865 | 7.328 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3900.4871 | 102.5828 | 2.9388 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.5686 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 15.5686 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.1034 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.1034 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C11 | 3978 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.501 |
| Bottom | 4553 | 0.95 | 0.507 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3505.6736 | -92.1992 | -7.1162 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3539.6836 | 93.0937 | 1.0909 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.9738 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.9738 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.2945 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.2945 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C12 | 3979 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.499 |
| Bottom | 4553 | 0.95 | 0.507 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3500.3607 | 92.0595 | 8.2002 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3534.3707 | 92.9539 | 1.4736 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.6024 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.6024 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.6705 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.6705 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C1 | 4254 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.576 |
| Bottom | 3770 | 0.77 | 0.579 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3961.1403 | -117.3818 | -2.0768 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3999.0785 | 8.9886 | 118.506 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4077 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.4077 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8855 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8855 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C2 | 4255 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.507 |
| Bottom | 4561 | 0.93 | 0.512 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3608.6118 | 106.9352 | 0.7007 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3643.3303 | 107.964 | -0.4929 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9887 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9887 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.3667 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.3667 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C3 | 4256 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.564 |
| Bottom | 3770 | 0.77 | 0.567 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3873.5483 | -114.7861 | 1.3467 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3916.7065 | -8.6601 | 116.0651 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9608 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9608 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4678 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4678 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C4 | 4257 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.491 |
| Bottom | 4561 | 0.93 | 0.495 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3495.9682 | 103.5972 | -0.7689 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3530.6867 | 104.626 | -2.4434 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1382 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1382 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.7507 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.7507 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C5 | 4258 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.56 |
| Bottom | 3770 | 0.77 | 0.566 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3851.6825 | -114.1382 | -2.6336 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3898.2035 | -4.6708 | 115.5168 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.0984 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.0984 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0244 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0244 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C6 | 4259 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.498 |
| Bottom | 4561 | 0.93 | 0.502 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3546.7218 | 105.1012 | 0.6225 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3581.4403 | 106.13 | -4.0504 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0048 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0048 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.7023 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.7023 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C7 | 4260 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.569 |
| Bottom | 3770 | 0.77 | 0.573 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3915.3181 | -116.0239 | 3.3282 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3964.5785 | 10.8647 | 117.4837 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.7961 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.7961 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.8183 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.8183 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C8 | 4261 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.508 |
| Bottom | 4561 | 0.93 | 0.512 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3612.6543 | 107.055 | -0.5701 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3647.3728 | 108.0838 | -1.6627 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.5716 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.5716 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 27.0971 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 27.0971 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C9 | 4262 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.575 |
| Bottom | 4553 | 0.95 | 0.581 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4026.1367 | -105.8874 | -7.7611 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4060.1466 | 106.7819 | 4.4637 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.52 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.52 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.3944 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.3944 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C10 | 4263 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.595 |
| Bottom | 4553 | 0.95 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4167.1077 | -109.5949 | 7.3572 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4189.781 | 110.1912 | 2.2632 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.1034 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 15.1034 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.7336 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.7336 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C11 | 4264 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.545 |
| Bottom | 4553 | 0.95 | 0.552 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3815.7137 | -100.3533 | -7.3231 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3849.7237 | 101.2477 | 1.5152 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.8212 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.8212 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.993 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.993 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C12 | 4265 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.95 | 0.544 |
| Bottom | 4553 | 0.95 | 0.551 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3810.182 | -100.2078 | 8.2137 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3844.192 | 101.1022 | 0.5718 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.1897 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.1897 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.3709 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.3709 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C1 | 4540 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.601 |
| Bottom | 4561 | 0.93 | 0.604 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4283.0206 | 126.9202 | -2.2499 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4321.4907 | 9.22 | 128.0602 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.17 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.17 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4758 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.4758 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C2 | 4541 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.509 |
| Bottom | 6437 | 1.31 | 0.514 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3918.2188 | -116.1099 | 0.5038 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3952.9373 | -117.1387 | -0.7432 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8325 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8325 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.0013 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.0013 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C3 | 4542 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.588 |
| Bottom | 4561 | 0.93 | 0.592 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4188.7587 | 124.1269 | 1.6024 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4233.7722 | -9.0116 | 125.4608 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.6884 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.6884 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1467 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1467 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C4 | 4543 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.494 |
| Bottom | 6437 | 1.31 | 0.498 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3799.8998 | -112.6037 | -0.5352 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3834.6183 | 113.6325 | -2.4297 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9318 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9318 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.447 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.447 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C5 | 4544 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.585 |
| Bottom | 4561 | 0.93 | 0.591 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4166.6926 | 123.473 | -2.7307 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4213.9483 | -4.7567 | 124.8733 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8368 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.8368 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6225 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6225 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C6 | 4545 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.501 |
| Bottom | 6437 | 1.31 | 0.504 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3852.7106 | 114.1687 | 0.5266 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3887.4291 | 115.1975 | -4.2228 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.7938 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.7938 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.3857 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.3857 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C7 | 4546 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.594 |
| Bottom | 4561 | 0.93 | 0.598 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4234.3386 | 125.4776 | 3.3214 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4286.7421 | 11.0189 | 127.0305 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.309 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.309 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5363 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5363 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C8 | 4547 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.51 |
| Bottom | 6437 | 1.31 | 0.514 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3924.3365 | -116.2912 | -0.6085 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3959.055 | 117.32 | -1.3333 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.0935 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.0935 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.8913 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.8913 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C9 | 4548 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.612 |
| Bottom | 4828 | 1.01 | 0.618 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4334.5545 | -113.9988 | -7.7839 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4368.5644 | 114.8932 | 4.7649 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.4625 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.4625 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.102 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.102 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C10 | 4549 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.63 |
| Bottom | 4828 | 1.01 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4464.7671 | -117.4234 | 7.3159 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4487.4404 | 118.0197 | 1.7208 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.6133 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.6133 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.3262 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.3262 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C11 | 4550 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.583 |
| Bottom | 4828 | 1.01 | 0.59 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4132.2394 | -108.6779 | -7.3957 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4166.2493 | 109.5724 | 1.8685 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.6779 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.6779 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6616 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.6616 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C12 | 4551 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.582 |
| Bottom | 4828 | 1.01 | 0.59 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4125.3039 | -108.4955 | 8.1223 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4159.3138 | 109.39 | -0.2359 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.7616 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.7616 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.0422 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.0422 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C1 | 4826 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.646 |
| Bottom | 4561 | 0.93 | 0.649 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4601.4674 | -136.3568 | -2.4855 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4640.8281 | 9.4264 | 137.5232 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8566 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.8566 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0554 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.0554 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C2 | 4827 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.549 |
| Bottom | 6437 | 1.31 | 0.553 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4225.9595 | 125.2293 | 0.2039 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4260.678 | 126.2581 | -1.3311 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6102 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6102 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.6181 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.6181 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C3 | 4828 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.632 |
| Bottom | 4561 | 0.93 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4500.8759 | -133.376 | 1.8287 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4548.1534 | -9.3619 | 134.7769 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.3498 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.3498 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7997 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7997 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C4 | 4829 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.533 |
| Bottom | 6437 | 1.31 | 0.537 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4102.3971 | -121.5677 | -0.3009 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4137.1156 | 122.5965 | -2.1042 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6681 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6681 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.1124 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.1124 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C5 | 4830 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.629 |
| Bottom | 4561 | 0.93 | 0.635 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4478.6613 | -132.7177 | -2.7944 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4527.0075 | -4.6706 | 134.1503 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5109 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.5109 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2085 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2085 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C6 | 4831 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.54 |
| Bottom | 6437 | 1.31 | 0.543 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4157.6374 | 123.2047 | 0.3865 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4192.3559 | 124.2335 | -4.5813 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5191 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5191 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.0541 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.0541 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C7 | 4832 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4561 | 0.93 | 0.639 |
| Bottom | 4561 | 0.93 | 0.643 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4572.2585 | -10.9993 | 135.4913 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4606.977 | 11.31 | 136.5201 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.7358 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.7358 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2366 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.2366 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C8 | 4833 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.55 |
| Bottom | 6437 | 1.31 | 0.555 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4234.9388 | -125.4954 | -0.5763 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4269.6573 | 126.5242 | -0.7859 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.5343 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.5343 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.6574 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.6574 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C9 | 4834 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.657 |
| Bottom | 4828 | 1.01 | 0.662 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4651.7329 | -122.3406 | -7.4843 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4685.7429 | 123.235 | 5.0798 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3775 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.3775 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.757 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.757 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C10 | 4835 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.674 |
| Bottom | 4828 | 1.01 | 0.679 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4771.4424 | -125.4889 | 7.0355 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4805.4524 | 126.3834 | 5.5968 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.0731 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.0731 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.8547 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.8547 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C11 | 4836 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.629 |
| Bottom | 4828 | 1.01 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4456.2151 | -117.1985 | -7.1678 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4490.2251 | 118.0929 | 2.2135 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.4854 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.4854 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.2838 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.2838 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C12 | 4837 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4828 | 1.01 | 0.628 |
| Bottom | 4828 | 1.01 | 0.635 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4446.5362 | -116.9439 | 7.7709 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4480.5461 | 117.8384 | -0.9942 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.2823 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.2823 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.6633 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.6633 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C1 | 5112 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.638 |
| Bottom | 6437 | 1.31 | 0.64 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4916.0603 | -145.6793 | -2.7902 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4956.6309 | 9.8499 | 146.8815 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5648 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.5648 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6703 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6703 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C2 | 5113 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.557 |
| Bottom | 7854 | 1.6 | 0.561 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4531.8256 | -134.2931 | -0.2844 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4566.5441 | 135.3219 | -2.3392 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.41 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.41 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.1112 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.1112 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C3 | 5114 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.625 |
| Bottom | 6437 | 1.31 | 0.628 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4809.4596 | 142.5203 | 1.935 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4859.3602 | -10.3475 | 143.999 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.0447 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.0447 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4621 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4621 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C4 | 5115 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.541 |
| Bottom | 7854 | 1.6 | 0.545 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4403.4605 | -130.4892 | -0.0335 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4438.179 | 131.518 | -1.3989 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4446 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.4446 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.6456 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.6456 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C5 | 5116 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.621 |
| Bottom | 6437 | 1.31 | 0.627 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4787.1571 | -141.8594 | -2.782 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4836.9054 | -4.7268 | 143.3336 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1906 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.1906 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8118 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8118 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C6 | 5117 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.548 |
| Bottom | 7854 | 1.6 | 0.551 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4461.4444 | -132.2075 | 0.0842 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4496.1629 | 133.2363 | -5.2347 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.2448 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.2448 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.5984 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.5984 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C7 | 5118 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.632 |
| Bottom | 6437 | 1.31 | 0.635 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4890.0747 | -10.2923 | -144.9092 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4924.7932 | -12.0015 | 145.938 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.1295 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.1295 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8912 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8912 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C8 | 5119 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.559 |
| Bottom | 7854 | 1.6 | 0.563 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4544.4435 | -134.667 | -0.2769 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4579.162 | 135.6958 | 0.1771 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.926 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.926 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.2457 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.2457 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C9 | 5120 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.656 |
| Bottom | 6437 | 1.34 | 0.661 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4978.2831 | -130.9288 | -6.8714 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5012.2931 | 131.8233 | 5.7047 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.2442 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.2442 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3157 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.3157 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C10 | 5121 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.67 |
| Bottom | 6437 | 1.34 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5087.6766 | -133.8059 | 6.5042 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5121.6866 | 134.7004 | 4.2803 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.4394 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 13.4394 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.2698 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.2698 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C11 | 5122 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.631 |
| Bottom | 6437 | 1.34 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4788.449 | -125.9362 | -6.657 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4822.4589 | 126.8307 | 2.8485 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.2332 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.2332 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.8143 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.8143 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C12 | 5123 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.629 |
| Bottom | 6437 | 1.34 | 0.635 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4774.5542 | -125.5708 | 7.1599 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4808.5641 | 126.4652 | -1.9748 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.714 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.714 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.1856 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.1856 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C1 | 5398 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.679 |
| Bottom | 6437 | 1.31 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5226.4052 | -154.8758 | -2.0076 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5237.978 | 155.2187 | 1.3585 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8266 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.8266 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0851 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0851 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C2 | 5399 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.594 |
| Bottom | 7854 | 1.6 | 0.598 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4835.7309 | -143.2988 | 0.2128 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4870.4494 | 144.3277 | -0.7897 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8652 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8652 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.1106 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.1106 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C3 | 5400 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.665 |
| Bottom | 6437 | 1.31 | 0.667 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5114.1059 | -151.548 | 0.4349 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5166.9262 | -11.4612 | 153.1132 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2878 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2878 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9668 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9668 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C4 | 5401 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.578 |
| Bottom | 7854 | 1.6 | 0.581 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4703.0368 | 139.3667 | 0.9279 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4737.7553 | 140.3955 | -3.0549 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8487 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8487 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.6046 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.6046 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C5 | 5402 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.661 |
| Bottom | 6437 | 1.31 | 0.666 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5091.7823 | 150.8865 | -1.6573 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5143.1951 | -6.599 | 152.41 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.3823 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.3823 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2256 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2256 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C6 | 5403 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.585 |
| Bottom | 7854 | 1.6 | 0.589 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4764.0072 | 141.1734 | 0.5936 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4798.7257 | 142.2022 | -3.6241 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5281 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5281 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.5847 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.5847 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C7 | 5404 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.31 | 0.673 |
| Bottom | 6437 | 1.31 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5204.9955 | -9.3979 | 154.2414 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5239.714 | -14.0299 | 155.2702 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.0165 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.0165 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5473 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.5473 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C8 | 5405 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.596 |
| Bottom | 7854 | 1.6 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4852.7732 | -143.8038 | -0.7887 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4887.4917 | 144.8327 | -1.4364 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.9303 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.9303 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.44 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.44 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C9 | 5406 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.7 |
| Bottom | 6437 | 1.34 | 0.705 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5314.639 | -139.775 | -6.1338 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5348.649 | 140.6695 | 7.0833 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.1169 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.1169 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.7887 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.7887 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C10 | 5407 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.714 |
| Bottom | 6437 | 1.34 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5413.8534 | -142.3843 | 5.8025 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5447.8634 | 143.2788 | 1.901 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.8571 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.8571 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.6091 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.6091 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C11 | 5408 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.676 |
| Bottom | 6437 | 1.34 | 0.681 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5129.5466 | -134.9071 | -6.0104 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5163.5565 | 135.8015 | 4.4693 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9353 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.9353 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.2928 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.2928 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C12 | 5409 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6437 | 1.34 | 0.673 |
| Bottom | 6437 | 1.34 | 0.679 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5109.8559 | -134.3892 | 6.4447 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5143.8659 | 135.2837 | -3.7349 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.2257 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.2257 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.6438 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.6438 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C1 | 5684 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.68 |
| Bottom | 7854 | 1.6 | 0.681 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5531.7553 | -163.9243 | -1.4992 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5543.3281 | 164.2673 | 0.1854 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9885 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.9885 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.231 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.231 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C2 | 5685 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.608 |
| Bottom | 8836 | 1.8 | 0.611 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5137.5146 | -152.2417 | 0.1291 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5172.2331 | 153.2705 | -5.1223 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8845 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8845 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.2692 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.2692 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C3 | 5686 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.665 |
| Bottom | 7854 | 1.6 | 0.668 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5414.0589 | -160.4366 | -1.1918 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5470.0156 | -12.2857 | 162.0948 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.3894 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.3894 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2996 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.2996 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C4 | 5687 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.592 |
| Bottom | 8836 | 1.8 | 0.596 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5001.0118 | -148.1966 | 1.6125 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5035.7303 | 149.2255 | 0.9995 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8669 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8669 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.073 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.073 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C5 | 5688 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.663 |
| Bottom | 7854 | 1.6 | 0.665 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5391.7952 | -159.7769 | -0.8311 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5445.0805 | -10.7462 | 161.3559 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.7198 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.7198 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.319 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.319 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C6 | 5689 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.599 |
| Bottom | 8836 | 1.8 | 0.601 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5065.1359 | -150.0969 | 0.7681 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5099.8544 | 151.1257 | -6.7758 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8471 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8471 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.0866 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.0866 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C7 | 5690 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.6 | 0.675 |
| Bottom | 7854 | 1.6 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5516.2792 | 9.0791 | -163.4657 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5539.4249 | 11.8252 | 164.1516 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.9303 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.9303 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0141 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0141 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C8 | 5691 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8836 | 1.8 | 0.611 |
| Bottom | 8836 | 1.8 | 0.614 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5159.7431 | -152.9004 | -0.6221 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5194.4616 | 153.9292 | 3.5195 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.5381 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.5381 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 24.2292 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 24.2292 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C9 | 5692 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.705 |
| Bottom | 7854 | 1.64 | 0.708 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5661.1822 | -148.8891 | -5.3407 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5695.1922 | 149.7836 | 10.5275 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.531 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.531 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.8965 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.8965 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C10 | 5693 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.716 |
| Bottom | 7854 | 1.64 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5750.3621 | -151.2345 | 5.1207 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5784.372 | -152.129 | -1.3728 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.627 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.627 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.3022 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.3022 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C11 | 5694 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.683 |
| Bottom | 7854 | 1.64 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5480.0423 | -144.1251 | -5.4775 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5514.0523 | 145.0196 | 7.3055 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.2083 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.2083 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.263 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.263 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C12 | 5695 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 57.5 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7854 | 1.64 | 0.679 |
| Bottom | 7854 | 1.64 | 0.683 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5452.9227 | -143.4119 | 5.6416 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5486.9326 | 144.3063 | -7.1354 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9953 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.9953 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.4844 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.4844 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C1 | 5970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.286 |
| Bottom | 3770 | 0.77 | 0.299 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1977.3232 | 6.1435 | -58.5947 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2012.0417 | 59.6235 | 81.9625 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.667 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.667 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.663 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.663 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C2 | 5971 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.248 |
| Bottom | 3770 | 0.77 | 0.252 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1705.3947 | -50.5365 | -0.0717 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1712.7842 | 50.7555 | 64.5735 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7204 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7204 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.5447 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.5447 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C3 | 5972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.28 |
| Bottom | 3770 | 0.77 | 0.299 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1933.1999 | 2.9383 | -57.2872 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1967.9184 | 58.316 | -93.5595 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.4776 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.4776 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.912 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.912 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C4 | 5973 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.238 |
| Bottom | 3770 | 0.77 | 0.251 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1641.3154 | -48.6376 | 2.6198 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1657.9197 | 49.1297 | -77.2454 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2714 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2714 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.1842 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.1842 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C5 | 5974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.28 |
| Bottom | 3770 | 0.77 | 0.304 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1925.6368 | 0.4903 | -57.063 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1960.3553 | 58.0919 | 105.6786 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.3611 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.3611 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.0886 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.0886 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C6 | 5975 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.244 |
| Bottom | 3770 | 0.77 | 0.256 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1684.2522 | -49.91 | 3.2663 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1649.8556 | 48.8907 | 90.1854 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2746 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2746 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.5962 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.5962 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C7 | 5976 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.298 |
| Bottom | 3770 | 0.77 | 0.321 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1945.7733 | 57.6597 | 98.9728 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2003.6375 | -59.3745 | -128.5852 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.3501 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.3501 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 25.1768 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 25.1768 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C8 | 5977 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.249 |
| Bottom | 3770 | 0.77 | 0.269 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1713.1114 | -50.7652 | 0.3435 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1662.036 | 49.2517 | -112.9123 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.8001 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.8001 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 31.5211 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 31.5211 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C9 | 5978 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.427 |
| Bottom | 4023 | 1.12 | 0.433 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2325.1879 | -61.1524 | -2.431 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2350.6954 | -62.9464 | 61.8233 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.0838 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.0838 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.3441 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.3441 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C10 | 5979 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.469 |
| Bottom | 4023 | 1.12 | 0.478 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2553.1052 | -67.1467 | 2.8229 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2578.6126 | -78.6213 | 67.8175 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.4454 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.4454 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 17.6736 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 17.6736 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C11 | 5980 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.372 |
| Bottom | 4023 | 1.12 | 0.381 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2026.8849 | -53.3071 | -2.9966 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2052.3924 | 63.675 | 53.9779 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0119 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.0119 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.8625 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.8625 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C12 | 5981 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.371 |
| Bottom | 4023 | 1.12 | 0.38 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1997.7091 | -59.7626 | -0.1689 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2040.2215 | 68.9119 | 53.6578 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 16.0894 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 16.0894 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.9503 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 13.9503 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C13 | 6210 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.402 |
| Bottom | 2514 | 1.05 | 0.39 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1310.4278 | -26.2086 | 73.4923 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1297.6629 | 30.2702 | -41.482 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.1763 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 23.1763 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.0896 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.0896 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C14 | 6212 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.222 |
| Bottom | 2514 | 1.05 | 0.226 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 745.1737 | -14.9035 | 32.7928 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 769.4665 | -15.7727 | 24.6742 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.6757 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 2.6757 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.4217 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.4217 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C15 | 6215 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.319 |
| Bottom | 2514 | 1.05 | 0.308 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1018.5081 | 20.3702 | 66.2469 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 953.9116 | -29.9802 | 30.4934 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.2972 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 19.2972 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.705 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.705 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C16 | 6217 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.313 |
| Bottom | 2514 | 1.05 | 0.315 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 999.8588 | -19.9972 | 64.4667 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 953.5621 | 32.8762 | 30.4822 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.6714 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.6714 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7919 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.7919 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C18 | 6219 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.22 |
| Bottom | 2514 | 1.05 | 0.226 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 738.5292 | 14.7706 | -31.5345 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 762.822 | -16.3561 | 24.4612 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.1059 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 2.1059 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.5385 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.5385 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C17 | 6222 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.352 |
| Bottom | 2514 | 1.05 | 0.369 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1122.9372 | -22.4587 | 73.3836 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1104.5339 | 39.4895 | -35.3083 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.4467 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 28.4467 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.9898 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.9898 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C20 | 6225 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.394 |
| Bottom | 2514 | 1.05 | 0.383 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1297.9576 | 25.9592 | 65.9917 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1312.2634 | 26.2453 | 25.9523 | 1060 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.0007 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 21.0007 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4659 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.4659 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C19 | 6227 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.359 |
| Bottom | 2514 | 1.05 | 0.364 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1154.8841 | 23.0977 | 71.0347 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1134.9454 | -35.0366 | -36.2804 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.3949 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 27.3949 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.4698 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.4698 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C21 | 6230 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.396 |
| Bottom | 2514 | 1.05 | 0.399 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1310.7039 | -26.2141 | -64.5375 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1303.3652 | 33.1853 | 41.6642 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.9312 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 20.9312 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.1742 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.1742 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C22 | 6232 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.233 |
| Bottom | 2514 | 1.05 | 0.233 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 746.9023 | -14.938 | 46.8564 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 771.1952 | 18.2308 | -24.7297 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.2034 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 2.2034 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.8229 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.8229 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C23 | 6235 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.303 |
| Bottom | 2514 | 1.05 | 0.326 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 977.9284 | 19.5586 | -59.209 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 970.5568 | -35.2872 | -31.0255 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.2602 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 17.2602 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.06 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.06 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C24 | 6237 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.254 |
| Bottom | 2514 | 1.05 | 0.248 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 820.2432 | -16.4049 | -48.5619 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 844.536 | 17.2709 | 27.0815 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.4623 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.4623 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.5036 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.5036 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C25 | 6241 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.314 |
| Bottom | 2514 | 1.05 | 0.329 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1024.7513 | -20.495 | -56.7939 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 994.9858 | 34.1909 | -31.8064 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.3245 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 16.3245 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5703 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.5703 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C26 | 6243 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.391 |
| Bottom | 2514 | 1.05 | 0.396 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1293.3205 | 25.8664 | -64.4122 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1284.43 | -33.464 | 41.0589 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.3933 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 20.3933 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.5504 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.5504 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C27 | 6258 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.344 |
| Bottom | 2514 | 1.05 | 0.365 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1109.1977 | 22.184 | -67.2486 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1071.1266 | -40.7548 | 34.2403 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.248 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 27.248 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.6599 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.6599 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C28 | 6262 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.349 |
| Bottom | 2514 | 1.05 | 0.369 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1124.5363 | -22.4907 | -67.7724 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1086.6128 | 40.9198 | 34.7354 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.6098 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 27.6098 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.0415 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.0415 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C29 | 6266 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.339 |
| Bottom | 2514 | 1.05 | 0.365 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1118.7133 | -22.3743 | 56.2507 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1053.5657 | 42.5575 | 33.679 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.2316 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 16.2316 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.3187 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.3187 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C30 | 6268 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.341 |
| Bottom | 2514 | 1.05 | 0.362 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1125.7524 | 22.515 | 56.3268 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1065.7691 | -40.19 | 34.0691 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.5586 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 16.5586 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.4545 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.4545 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C31 | 6270 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.366 |
| Bottom | 2514 | 1.05 | 0.398 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1218.5979 | -24.372 | -56.6268 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1150.1578 | 46.1822 | -36.7667 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.1586 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 17.1586 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.2677 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.2677 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C32 | 6272 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.359 |
| Bottom | 2514 | 1.05 | 0.378 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1188.814 | 23.7763 | -58.1502 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1125.7802 | -40.9204 | -35.9874 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.2408 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 17.2408 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.4136 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.4136 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C33 | 6274 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.432 |
| Bottom | 3770 | 1.26 | 0.535 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1932.8739 | 38.6575 | -55.3653 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1956.7168 | -86.454 | 75.5945 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.8345 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.8345 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 24.8195 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 24.8195 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C35 | 6280 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.361 |
| Bottom | 3770 | 1.26 | 0.435 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1611.1505 | 32.223 | -46.7463 | 2120 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1623.0769 | 67.6803 | 62.7049 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.5821 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 36.5821 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 15.7907 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 15.7907 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C34 | 6282 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.343 |
| Bottom | 3770 | 1.26 | 0.435 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1534.7088 | 30.6942 | 36.5706 | 2120 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1551.5225 | -73.4576 | -59.9405 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.7841 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 28.7841 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 16.9463 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 16.9463 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C36 | 6286 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.364 |
| Bottom | 3770 | 1.26 | 0.454 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1630.716 | -32.6143 | 41.1766 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1654.5589 | 73.9183 | -63.9211 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.1428 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 31.1428 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 17.1142 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 17.1142 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C37 | 6290 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.418 |
| Bottom | 2514 | 1.05 | 0.511 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1405.081 | 28.1016 | 59.723 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1441.6879 | -62.0403 | 46.086 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.9326 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 17.9326 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.0877 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.0877 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C38 | 6293 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.43 |
| Bottom | 2514 | 1.05 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1446.0652 | -28.9213 | 61.6528 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1487.4125 | 63.286 | 47.5476 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.6648 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.6648 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.6214 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.6214 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C39 | 6296 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.202 |
| Bottom | 5182 | 0.93 | 0.221 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1632.1585 | -32.6432 | -49.1561 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1657.825 | -55.1008 | -86.1516 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.7607 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.7607 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.4186 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.4186 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C40 | 6298 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.217 |
| Bottom | 5182 | 0.93 | 0.244 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1745.0242 | 34.9005 | -4.2468 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1778.4043 | 67.652 | -92.4177 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.1224 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.1224 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 27.4503 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 27.4503 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C41 | 6300 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.201 |
| Bottom | 5182 | 0.93 | 0.22 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1612.1592 | 32.2432 | 4.5656 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1645.5393 | -55.3006 | 85.5132 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.7384 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.7384 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.3107 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.3107 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C42 | 6302 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.206 |
| Bottom | 5182 | 0.93 | 0.23 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1651.6779 | 33.0336 | 3.0278 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1685.058 | 62.7113 | 87.5668 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.3416 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.3416 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 26.0134 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 26.0134 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C43 | 6304 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.574 |
| Bottom | 2514 | 1.05 | 0.627 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1972.8691 | 39.4574 | -29.1773 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1991.9434 | -56.9184 | -63.6758 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.0942 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 16.0942 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.2793 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.2793 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C44 | 6306 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.428 |
| Bottom | 2514 | 1.05 | 0.509 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1440.1851 | -28.8037 | -61.6272 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1446.8618 | 61.067 | -46.2514 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.9613 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.9613 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.5863 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.5863 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C1 | 6325 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.119 |
| Bottom | 3770 | 0.77 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 654.6806 | -24.1706 | -65.2794 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 712.5448 | 33.9831 | 46.4639 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.2166 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.2166 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.1768 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.1768 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C2 | 6326 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.121 |
| Bottom | 3770 | 0.77 | 0.113 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 711.9065 | 59.2939 | -21.0962 | 3150 | 203] 1.5 [DL + RSY] |
| Bottom | 762.523 | 22.5961 | 30.4581 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.86 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.86 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.169 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.169 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C3 | 6327 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.123 |
| Bottom | 3770 | 0.77 | 0.117 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 636.6518 | -31.3316 | 69.9151 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 694.516 | 34.8646 | -48.9842 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.0291 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.0291 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.9529 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.9529 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C4 | 6328 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.119 |
| Bottom | 3770 | 0.77 | 0.112 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 686.6417 | 58.0638 | 26.561 | 3150 | 203] 1.5 [DL + RSY] |
| Bottom | 738.3571 | 21.88 | -34.2767 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2977 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2977 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.7398 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.7398 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C5 | 6329 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.123 |
| Bottom | 3770 | 0.77 | 0.111 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 635.8253 | 28.0951 | -72.1459 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 693.6894 | -26.5546 | 40.9198 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.9474 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.9474 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.8583 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.8583 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C6 | 6330 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.124 |
| Bottom | 3770 | 0.77 | 0.111 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 671.5664 | -20.9007 | -71.8313 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 758.6411 | 26.6161 | 23.8473 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.3077 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.3077 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.6014 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.6014 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C7 | 6331 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.149 |
| Bottom | 3770 | 0.77 | 0.13 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 661.1355 | 42.3279 | 98.8946 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 718.9996 | -45.3152 | -58.0954 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.7608 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.7608 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 24.6634 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 24.6634 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C8 | 6332 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.143 |
| Bottom | 3770 | 0.77 | 0.122 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 674.2234 | -22.5232 | 98.125 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 766.1325 | 36.7928 | -38.3634 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.2939 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.2939 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 27.3432 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 27.3432 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C9 | 6333 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.275 |
| Bottom | 3218 | 0.89 | 0.278 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1365.1624 | 58.0786 | -35.9038 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1436.2835 | -39.167 | 37.7743 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.4461 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.4461 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.0786 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.0786 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C10 | 6334 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.347 |
| Bottom | 3218 | 0.89 | 0.344 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1686.4943 | 81.1739 | -44.3548 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1729.0067 | -68.3807 | 45.4729 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 16.3517 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 16.3517 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 25.6825 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 25.6825 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C11 | 6335 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.232 |
| Bottom | 3218 | 0.89 | 0.222 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1083.4674 | -63.5561 | 28.4952 | 3150 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1117.4773 | 42.9948 | -29.3897 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.3561 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.3561 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 17.4622 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 17.4622 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C12 | 6336 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.232 |
| Bottom | 3218 | 0.89 | 0.227 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1110.8971 | -57.168 | -29.2166 | 3150 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1144.907 | 43.9343 | 30.1111 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.259 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.259 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 19.8241 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 19.8241 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C13 | 6565 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.216 |
| Bottom | 2060 | 0.86 | 0.269 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 504.6126 | -18.0775 | 62.4732 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 528.4556 | 26.4853 | -78.5606 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.4473 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.4473 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.2459 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.2459 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C14 | 6567 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.109 |
| Bottom | 2060 | 0.86 | 0.113 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 277.0267 | -5.5405 | -35.184 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 301.3196 | 6.0264 | -33.9899 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.0683 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 5.0683 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5171 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5171 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C15 | 6570 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.186 |
| Bottom | 2060 | 0.86 | 0.211 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 428.24 | 9.4955 | 67.0851 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 452.0829 | -13.22 | -76.2153 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.0748 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.0748 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.4987 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.4987 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C16 | 6572 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.162 |
| Bottom | 2060 | 0.86 | 0.21 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 392.5728 | -10.9415 | 50.8151 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 416.4157 | 14.8613 | -75.2945 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.6692 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.6692 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4393 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.4393 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C18 | 6574 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.112 |
| Bottom | 2060 | 0.86 | 0.108 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 272.556 | -5.4511 | 38.2253 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 296.8488 | 5.937 | 30.482 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.1473 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 4.1473 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.383 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.383 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C17 | 6577 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.193 |
| Bottom | 2060 | 0.86 | 0.197 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 425.6485 | -8.513 | 74.1926 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 449.4915 | 11.2266 | -69.3219 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.6771 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.6771 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.9121 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.9121 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C20 | 6580 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.207 |
| Bottom | 2060 | 0.86 | 0.256 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 502.3795 | 18.0465 | 54.3018 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 526.2224 | -26.1121 | -70.5061 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.4145 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.4145 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.1303 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.1303 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C19 | 6582 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.192 |
| Bottom | 2060 | 0.86 | 0.194 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 436.3806 | 8.7276 | 71.5968 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 460.2235 | -9.2045 | -69.1475 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.221 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.221 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.6826 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.6826 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C21 | 6585 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.206 |
| Bottom | 2060 | 0.86 | 0.267 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 508.3437 | -17.6993 | -53.3685 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 532.1867 | 25.6299 | 78.9002 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.4708 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 44.4708 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.8345 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.8345 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C22 | 6587 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.12 |
| Bottom | 2060 | 0.86 | 0.108 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 278.2434 | 5.5649 | -43.6884 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 302.5362 | -6.0507 | -29.2331 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.2293 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 5.2293 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3419 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3419 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C23 | 6590 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.152 |
| Bottom | 2060 | 0.86 | 0.214 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 371.744 | 15.7749 | -33.1076 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 395.587 | -17.2006 | 73.6852 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.4929 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 40.4929 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8321 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.8321 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C24 | 6592 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.131 |
| Bottom | 2060 | 0.86 | 0.123 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 316.7401 | -6.3348 | 45.4852 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 341.0329 | 6.8207 | 34.4588 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.7254 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.7254 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3238 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3238 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C25 | 6596 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.176 |
| Bottom | 2060 | 0.86 | 0.204 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 447.8864 | -8.9577 | -56.6261 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 471.7293 | 12.3013 | 70.203 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.2386 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.2386 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0219 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.0219 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C26 | 6598 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.196 |
| Bottom | 2060 | 0.86 | 0.247 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 500.985 | 18.8953 | -42.4533 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 538.251 | -22.8594 | 72.1111 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.4509 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.4509 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.781 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.781 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C27 | 6600 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.183 |
| Bottom | 2060 | 0.86 | 0.192 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 425.8824 | 8.5176 | -66.0879 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 449.7253 | -9.8969 | 67.7709 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.3288 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 40.3288 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.1164 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.1164 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C28 | 6604 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.188 |
| Bottom | 2060 | 0.86 | 0.202 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 431.3561 | -8.6271 | -69.2112 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 455.1991 | 9.3965 | 75.3846 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.6126 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.6126 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.8561 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.8561 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C29 | 6608 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.158 |
| Bottom | 2060 | 0.86 | 0.185 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 418.2103 | -9.9701 | 45.2035 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 442.0532 | 15.6574 | -51.6536 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 32.2014 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 32.2014 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.6705 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.6705 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C30 | 6610 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.159 |
| Bottom | 2060 | 0.86 | 0.189 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 421.4252 | 9.6291 | 46.4606 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 445.2682 | -15.1848 | -55.5167 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 33.9292 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 33.9292 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4693 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.4693 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C31 | 6612 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.169 |
| Bottom | 2060 | 0.86 | 0.212 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 452.8199 | -10.9896 | -46.5004 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 476.6628 | 17.3089 | 65.5689 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.503 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.503 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.4582 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.4582 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C32 | 6614 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.165 |
| Bottom | 2060 | 0.86 | 0.199 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 439.6888 | 9.3093 | -48.7722 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 463.5317 | -15.0421 | 61.5888 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.6435 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.6435 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.3285 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.3285 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C33 | 6616 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.342 |
| Bottom | 3142 | 1.05 | 0.383 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1362.9906 | 35.3407 | -70.2556 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 1392.7943 | -48.9138 | 96.2327 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 78.0899 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 78.0899 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 18.3815 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 18.3815 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C35 | 6622 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.265 |
| Bottom | 3142 | 1.05 | 0.281 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1117.0166 | -22.3403 | -53.2121 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1140.8596 | 22.9859 | 80.6507 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 65.5472 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 65.5472 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.3166 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 9.3166 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C34 | 6624 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.238 |
| Bottom | 3142 | 1.05 | 0.257 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1007.0742 | 20.1415 | 44.1358 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1030.9171 | -25.8133 | -54.5789 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.979 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.979 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.8138 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 9.8138 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C36 | 6628 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.27 |
| Bottom | 3142 | 1.05 | 0.286 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1141.9409 | -22.8388 | 49.7949 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1122.0293 | 30.0292 | -68.5469 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.998 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.998 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.7658 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 9.7658 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C37 | 6632 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.201 |
| Bottom | 2060 | 0.86 | 0.222 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 501.3009 | 25.6876 | 19.5947 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 525.1439 | -27.9566 | -32.6266 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 33.8583 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 33.8583 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5095 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.5095 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C38 | 6635 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.208 |
| Bottom | 2060 | 0.86 | 0.228 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 517.0686 | -26.0347 | 23.2379 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 540.9116 | 27.9673 | -35.822 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.0825 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 36.0825 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5101 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.5101 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C39 | 6638 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.125 |
| Bottom | 4553 | 0.81 | 0.108 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 710.9458 | 52.9598 | -36.9455 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 770.4177 | -20.6835 | 83.8233 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.8836 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.8836 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.672 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.672 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C40 | 6640 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.129 |
| Bottom | 4553 | 0.81 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 788.3074 | -49.76 | 40.9657 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 836.9709 | 26.9965 | 82.3533 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 2.2094 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 2.2094 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 25.3548 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 25.3548 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C41 | 6642 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.124 |
| Bottom | 4553 | 0.81 | 0.106 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 706.9136 | 52.1933 | 36.7359 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 764.2369 | -21.6287 | -76.5802 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.2683 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.2683 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.8247 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.8247 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C42 | 6644 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.124 |
| Bottom | 4553 | 0.81 | 0.109 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 728.8336 | -50.6795 | 37.8751 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 770.729 | 24.249 | -79.3601 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.3073 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.3073 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 25.0232 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 25.0232 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C43 | 6646 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.354 |
| Bottom | 2060 | 0.86 | 0.372 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1161.5603 | -23.2312 | -22.3763 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1180.6347 | -27.2016 | 41.5797 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.0937 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.0937 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.9637 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.9637 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C44 | 6648 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.196 |
| Bottom | 2060 | 0.86 | 0.229 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 511.1062 | -23.0545 | -22.7097 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 534.9491 | 27.6975 | 42.3956 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.4464 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.4464 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7855 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.7855 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C1 | 6667 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.172 |
| Bottom | 3770 | 0.77 | 0.171 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1088.8429 | -35.8469 | -63.8604 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1146.7071 | 33.9808 | 47.7028 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.0386 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.0386 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.8106 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.8106 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C2 | 6668 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.155 |
| Bottom | 3770 | 0.77 | 0.159 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1037.4998 | 44.0788 | -30.7446 | 3150 | 203] 1.5 [DL + RSY] |
| Bottom | 1095.3639 | 32.4593 | 0.4237 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5026 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.5026 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.808 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.808 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C3 | 6669 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.17 |
| Bottom | 3770 | 0.77 | 0.168 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1061.2264 | -37.7634 | 65.2098 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1119.0906 | 33.1624 | -50.1374 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.9725 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.9725 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.8294 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.8294 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C4 | 6670 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.152 |
| Bottom | 3770 | 0.77 | 0.153 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 989.2333 | -29.3143 | 50.3682 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1047.0975 | 31.029 | -33.7401 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2559 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2559 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.9292 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.9292 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C5 | 6671 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.171 |
| Bottom | 3770 | 0.77 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1058.4712 | 35.5873 | -68.9073 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1116.3354 | 33.0807 | 48.4209 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.3763 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.3763 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.6969 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.6969 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C6 | 6672 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.153 |
| Bottom | 3770 | 0.77 | 0.157 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 979.1173 | -29.0145 | -56.1375 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1079.1967 | 31.9802 | -1.3012 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2504 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2504 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.5302 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.5302 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C7 | 6673 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.195 |
| Bottom | 3770 | 0.77 | 0.183 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1089.0929 | 49.7476 | 99.4309 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1146.957 | -44.3256 | -66.9381 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 25.9249 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 25.9249 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 26.6874 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 26.6874 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C8 | 6674 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.17 |
| Bottom | 3770 | 0.77 | 0.163 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 985.6442 | -29.2079 | 85.6919 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1094.5253 | 40.277 | -37.8078 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.4342 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.4342 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 25.55 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 25.55 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C9 | 6675 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.328 |
| Bottom | 3218 | 0.89 | 0.333 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1667.552 | 59.3248 | -43.8566 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1710.0644 | -50.5893 | -44.9747 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.2304 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.2304 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.7589 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.7589 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C10 | 6676 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.387 |
| Bottom | 3218 | 0.89 | 0.391 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1951.5117 | 75.3992 | -51.3248 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1994.0241 | -68.079 | 52.4428 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 16.517 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 16.517 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 22.5291 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 22.5291 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C11 | 6677 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.271 |
| Bottom | 3218 | 0.89 | 0.273 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1332.4633 | -59.719 | -35.0438 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1403.6517 | 41.4571 | -36.916 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.7626 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.7626 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.2921 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.2921 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C12 | 6678 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.274 |
| Bottom | 3218 | 0.89 | 0.278 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1390.9094 | -49.8526 | -36.5809 | 3150 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1424.9193 | 43.7237 | 37.4754 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.6316 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.6316 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 17.0233 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 17.0233 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C13 | 6907 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.277 |
| Bottom | 2060 | 0.86 | 0.317 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 748.8257 | -23.0331 | 63.0681 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 796.0935 | 26.339 | -81.9836 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.7129 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.7129 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.428 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.428 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C14 | 6909 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.151 |
| Bottom | 2060 | 0.86 | 0.154 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 432.6599 | -8.6532 | 39.6152 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 456.9528 | 9.1391 | -35.447 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.0481 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 9.0481 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5744 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5744 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C15 | 6912 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.228 |
| Bottom | 2060 | 0.86 | 0.252 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 621.9141 | 12.4383 | 65.9873 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 645.7571 | -13.5972 | -79.4641 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.5763 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.5763 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8435 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.8435 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C16 | 6914 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.221 |
| Bottom | 2060 | 0.86 | 0.249 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 592.2542 | -11.8451 | 65.8749 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 616.0972 | 15.1622 | -79.2832 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.4695 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.4695 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4322 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.4322 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C18 | 6916 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.145 |
| Bottom | 2060 | 0.86 | 0.148 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 427.4929 | -8.5499 | -34.6337 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 451.7857 | 9.0357 | 29.5984 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.5752 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 5.5752 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5946 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5946 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C17 | 6919 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.227 |
| Bottom | 2060 | 0.86 | 0.249 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 655.8298 | -13.1166 | 58.0362 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 679.6728 | 13.5935 | -71.2529 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.854 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 36.854 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7218 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.7218 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C20 | 6922 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.271 |
| Bottom | 2060 | 0.86 | 0.305 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 748.7588 | 22.8459 | 58.2665 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 790.7393 | -25.7758 | -73.552 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.8602 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.8602 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.3762 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.3762 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C19 | 6924 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.231 |
| Bottom | 2060 | 0.86 | 0.252 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 673.4349 | 13.4687 | 56.8596 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 697.2779 | -13.9456 | -70.797 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.6511 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 36.6511 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.4804 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.4804 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C21 | 6927 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.276 |
| Bottom | 2060 | 0.86 | 0.313 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 755.4983 | -24.1591 | -57.8461 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 799.3792 | 25.5832 | 79.9491 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.472 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.472 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.2196 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.2196 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C22 | 6929 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.16 |
| Bottom | 2060 | 0.86 | 0.154 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 433.2541 | -8.6651 | 46.722 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 457.5469 | 9.1509 | -34.7417 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.9175 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.9175 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4682 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4682 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C23 | 6932 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.212 |
| Bottom | 2060 | 0.86 | 0.246 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 583.7243 | 11.6745 | -60.1605 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 585.8476 | -19.3305 | 72.2827 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.3962 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.3962 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8656 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.8656 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C24 | 6934 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.175 |
| Bottom | 2060 | 0.86 | 0.173 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 483.5138 | -9.6703 | -49.4426 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 507.8066 | 10.1561 | 41.2314 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 11.0596 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 11.0596 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5579 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5579 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C25 | 6938 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.221 |
| Bottom | 2060 | 0.86 | 0.245 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 637.6734 | -12.7535 | -56.7288 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 661.5163 | 13.2303 | 71.6869 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.2221 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.2221 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.4518 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.4518 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C26 | 6940 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.271 |
| Bottom | 2060 | 0.86 | 0.3 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 753.2313 | 22.5643 | -57.9368 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 797.3038 | -23.3575 | 74.1078 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.788 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.788 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.8191 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.8191 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C27 | 6942 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.221 |
| Bottom | 2060 | 0.86 | 0.244 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 651.5193 | 13.0304 | -52.8733 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 675.3623 | -13.5072 | 68.312 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 35.611 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 35.611 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0237 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.0237 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C28 | 6946 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.224 |
| Bottom | 2060 | 0.86 | 0.254 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 660.7124 | -13.2142 | -53.4299 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 684.5554 | 13.6911 | 74.8287 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.7109 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.7109 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.8015 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.8015 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C29 | 6950 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.222 |
| Bottom | 2060 | 0.86 | 0.241 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 648.9573 | -12.9791 | 54.4463 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 672.8002 | 17.0879 | -58.5135 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.0718 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.0718 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.6365 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.6365 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C30 | 6952 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.224 |
| Bottom | 2060 | 0.86 | 0.243 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 653.7552 | 13.0751 | 54.5762 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 677.5981 | -16.2826 | -61.7855 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.2779 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.2779 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.1895 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.1895 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C31 | 6954 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.239 |
| Bottom | 2060 | 0.86 | 0.269 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 706.9214 | -14.1384 | -55.7785 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 730.7644 | 18.6318 | 70.0354 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.1011 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.1011 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.3865 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.3865 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C32 | 6956 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.234 |
| Bottom | 2060 | 0.86 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 687.1753 | 13.7435 | -55.9356 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 711.0182 | -16.1763 | 66.333 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.9297 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 40.9297 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.154 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.154 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C33 | 6958 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.377 |
| Bottom | 3142 | 1.05 | 0.421 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1548.4945 | 35.9058 | -72.1834 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 1578.2982 | -51.0439 | 95.2831 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 77.9546 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 77.9546 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 18.6046 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 18.6046 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C35 | 6964 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.303 |
| Bottom | 3142 | 1.05 | 0.314 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1276.2436 | -25.5249 | -59.9217 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1300.0866 | 26.0017 | 79.7556 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 67.6939 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 67.6939 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.1122 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.1122 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C34 | 6966 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.277 |
| Bottom | 3142 | 1.05 | 0.296 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1178.4912 | 23.5698 | 46.8226 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1149.4001 | -33.3651 | -58.9361 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.1514 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.1514 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.2864 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.2864 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C36 | 6970 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.304 |
| Bottom | 3142 | 1.05 | 0.325 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1293.3892 | 25.8678 | 51.1529 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1295.5233 | 33.4969 | -68.3675 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.1265 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 52.1265 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.2934 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.2934 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C37 | 6974 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.269 |
| Bottom | 2060 | 0.86 | 0.296 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 805.4278 | 22.2062 | 41.2672 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 829.2707 | -30.3911 | -37.7356 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.64 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.64 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.355 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.355 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C38 | 6977 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.276 |
| Bottom | 2060 | 0.86 | 0.304 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 819.8276 | -16.3966 | 63.5329 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 855.2667 | 30.5908 | -40.7331 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.0454 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 44.0454 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.5548 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.5548 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C39 | 6980 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.136 |
| Bottom | 4553 | 0.81 | 0.142 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1037.5079 | 20.7502 | 83.011 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1070.888 | -21.4178 | 94.0029 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 5.6416 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 5.6416 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.5032 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 13.5032 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C40 | 6982 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.144 |
| Bottom | 4553 | 0.81 | 0.152 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1113.9505 | -22.279 | 82.1918 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1147.3306 | 26.8099 | 90.1158 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.3754 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.3754 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 15.7911 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 15.7911 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C41 | 6984 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.134 |
| Bottom | 4553 | 0.81 | 0.14 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1026.7649 | -20.5353 | -78.2908 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1060.145 | -21.2029 | -90.8259 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.558 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 6.558 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.8887 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 13.8887 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C42 | 6986 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.134 |
| Bottom | 4553 | 0.81 | 0.142 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1051.8013 | 21.036 | 1.4295 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1065.5119 | 23.2851 | -91.3682 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.4943 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 6.4943 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 14.4411 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 14.4411 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C43 | 6988 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.434 |
| Bottom | 2060 | 0.86 | 0.441 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1427.428 | -28.5486 | -21.3443 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1446.5023 | 28.93 | 39.8708 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 39.6884 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 39.6884 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8792 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.8792 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C44 | 6990 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.276 |
| Bottom | 2060 | 0.86 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 822.99 | -16.4598 | -62.4632 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 837.7508 | 30.2589 | 46.1741 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.8851 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 44.8851 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7195 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.7195 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C1 | 7009 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.227 |
| Bottom | 3770 | 0.77 | 0.23 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1521.853 | -45.0976 | -63.643 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1579.7172 | 46.8123 | 48.0834 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.2659 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.2659 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.5662 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.5662 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C2 | 7010 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.201 |
| Bottom | 3770 | 0.77 | 0.206 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1383.7211 | -41.0043 | 0.4262 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1418.4396 | 2.1816 | 42.0331 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0914 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0914 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.3273 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.3273 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C3 | 7011 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.223 |
| Bottom | 3770 | 0.77 | 0.226 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1485.5317 | -44.0213 | 64.9867 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1543.3959 | 45.736 | -51.8861 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 19.2076 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 19.2076 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.3917 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.3917 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C4 | 7012 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.193 |
| Bottom | 3770 | 0.77 | 0.198 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1331.6993 | -39.4627 | -2.5716 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1366.4178 | 1.8693 | 40.4915 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7456 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.7456 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.3055 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.3055 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C5 | 7013 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.225 |
| Bottom | 3770 | 0.77 | 0.225 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1480.5424 | 43.8734 | -71.2731 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1538.4066 | -45.5881 | 52.7428 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.3414 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.3414 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5877 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.5877 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C6 | 7014 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.199 |
| Bottom | 3770 | 0.77 | 0.203 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1364.3235 | -40.4295 | 0.3778 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1399.042 | -0.7531 | 41.4583 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.5417 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.5417 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6354 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.6354 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C7 | 7015 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.246 |
| Bottom | 3770 | 0.77 | 0.241 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1517.134 | 49.1452 | 100.7502 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1574.9982 | -53.2463 | -74.2053 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 27.1778 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 27.1778 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 24.9497 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 24.9497 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C8 | 7016 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.211 |
| Bottom | 3770 | 0.77 | 0.207 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1295.6916 | -38.3957 | 89.1639 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1421.4536 | 42.1224 | -43.0507 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.8758 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.8758 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.671 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.671 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C9 | 7017 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.367 |
| Bottom | 4023 | 1.12 | 0.373 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1982.0266 | 59.8655 | -52.1273 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2024.539 | -53.7425 | 53.2454 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5255 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.5255 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.4199 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.4199 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C10 | 7018 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.417 |
| Bottom | 4023 | 1.12 | 0.422 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2234.7897 | 76.844 | -58.775 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 2277.3021 | -70.421 | 59.893 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.1005 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.1005 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.6843 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 23.6843 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C11 | 7019 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.313 |
| Bottom | 4023 | 1.12 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1667.2475 | -62.3354 | -43.8486 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1709.7599 | 55.9629 | -0.4351 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.1003 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.1003 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.017 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 13.017 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C12 | 7020 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4023 | 1.12 | 0.311 |
| Bottom | 4023 | 1.12 | 0.316 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1679.5207 | -51.1852 | -44.1714 | 3150 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1698.2981 | 55.6322 | 44.6652 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.7632 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.7632 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 18.2092 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 18.2092 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C13 | 7249 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.325 |
| Bottom | 2514 | 1.05 | 0.377 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1041.0791 | -20.8216 | 66.3534 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1064.922 | 31.2556 | -93.7048 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.3568 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 52.3568 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.6986 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.6986 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C14 | 7251 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.184 |
| Bottom | 2514 | 1.05 | 0.195 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 588.9311 | -11.7786 | 37.1339 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 613.2239 | 12.2645 | -43.5346 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.0091 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 8.0091 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6963 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.6963 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C15 | 7254 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.266 |
| Bottom | 2514 | 1.05 | 0.308 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 818.9041 | 16.3781 | 65.7334 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 842.7471 | -16.8549 | -100.4297 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 54.1406 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 54.1406 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6329 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.6329 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C16 | 7256 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.259 |
| Bottom | 2514 | 1.05 | 0.303 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 795.0274 | -15.9005 | 64.4861 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 818.8704 | 16.3774 | -100.1918 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.6466 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 53.6466 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0654 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.0654 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C18 | 7258 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.18 |
| Bottom | 2514 | 1.05 | 0.188 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 582.9599 | -11.6592 | -34.6521 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 607.2527 | 12.1451 | 35.7252 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.5149 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 4.5149 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7291 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.7291 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C17 | 7261 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.281 |
| Bottom | 2514 | 1.05 | 0.297 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 887.7065 | -17.7541 | 61.779 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 911.5494 | 18.231 | -74.8529 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.7744 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.7744 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.2039 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.2039 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C20 | 7264 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.318 |
| Bottom | 2514 | 1.05 | 0.366 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1032.2742 | 20.6455 | 59.6548 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1056.1172 | -31.3961 | -84.4132 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.8966 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.8966 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.8718 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.8718 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C19 | 7266 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.287 |
| Bottom | 2514 | 1.05 | 0.305 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 912.462 | 18.2492 | 60.4889 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 936.305 | -18.7261 | -75.8799 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.9304 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.9304 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.1534 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.1534 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C21 | 7269 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.32 |
| Bottom | 2514 | 1.05 | 0.372 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1017.3298 | -23.9846 | -57.4465 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 1066.9796 | 31.0216 | 89.2274 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.0192 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.0192 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.702 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.702 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C22 | 7271 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.192 |
| Bottom | 2514 | 1.05 | 0.197 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 589.7062 | -11.7941 | 47.616 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 613.9991 | -12.28 | -46.3716 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.4503 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.4503 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.8958 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.8958 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C23 | 7274 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.251 |
| Bottom | 2514 | 1.05 | 0.294 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 780.0994 | 15.602 | -58.8378 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 803.9424 | -16.0788 | 96.0371 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.5372 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.5372 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.5877 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.5877 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C24 | 7276 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.209 |
| Bottom | 2514 | 1.05 | 0.218 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 651.5781 | -13.0316 | -48.6759 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 675.871 | -13.5174 | 52.3909 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.8942 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 9.8942 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.9222 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.9222 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C25 | 7280 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.262 |
| Bottom | 2514 | 1.05 | 0.299 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 830.1133 | -16.6023 | -56.4895 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 853.9562 | 17.0791 | 89.8884 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.7666 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.7666 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.1011 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.1011 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C26 | 7282 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.317 |
| Bottom | 2514 | 1.05 | 0.358 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1033.2646 | 20.6653 | -58.1052 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1057.1076 | -28.0902 | 84.805 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.7852 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.7852 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 14.9793 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 14.9793 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C27 | 7284 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.275 |
| Bottom | 2514 | 1.05 | 0.293 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 878.7815 | 17.5756 | -56.8297 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 902.6244 | -18.0525 | 71.8788 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.3467 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.3467 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.7087 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.7087 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C28 | 7288 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.279 |
| Bottom | 2514 | 1.05 | 0.3 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 891.2407 | -17.8248 | -56.9765 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 915.0837 | 18.3017 | 76.7816 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.7705 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.7705 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.2878 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.2878 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C29 | 7292 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.275 |
| Bottom | 2514 | 1.05 | 0.297 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 883.1311 | -17.6626 | 54.4388 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 906.974 | 18.1395 | -75.5582 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.404 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.404 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.5475 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.5475 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C30 | 7294 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.276 |
| Bottom | 2514 | 1.05 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 889.2094 | 17.7842 | 54.3284 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 913.0523 | -18.261 | -78.408 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.294 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.294 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3305 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.3305 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C31 | 7296 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.297 |
| Bottom | 2514 | 1.05 | 0.327 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 962.7948 | -19.2559 | -55.3942 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 986.6378 | 19.7328 | 86.8256 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.9362 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.9362 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.095 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.095 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C32 | 7298 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.291 |
| Bottom | 2514 | 1.05 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 937.4959 | 18.7499 | -56.2221 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 961.3389 | -19.2268 | 83.5309 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.0709 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.0709 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.2875 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.2875 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C33 | 7300 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.391 |
| Bottom | 3770 | 1.26 | 0.42 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1736.7799 | 35.07 | -71.8975 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 1766.5836 | -42.5253 | 106.6321 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 82.6064 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 82.6064 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 16.3949 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 16.3949 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C35 | 7306 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.323 |
| Bottom | 3770 | 1.26 | 0.337 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1439.6818 | -28.7936 | -58.6808 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1463.5248 | 29.2705 | 87.9637 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 71.1048 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 71.1048 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.2499 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 8.2499 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C34 | 7308 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.303 |
| Bottom | 3770 | 1.26 | 0.311 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1353.2596 | 27.0652 | 45.8942 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1377.1025 | -27.5421 | -61.999 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.5723 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.5723 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.9239 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.9239 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C36 | 7312 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 1.26 | 0.325 |
| Bottom | 3770 | 1.26 | 0.335 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1449.722 | 28.9944 | 49.9404 | 2650 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1473.597 | 29.4719 | -75.5399 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 54.4724 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 54.4724 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.886 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.886 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C37 | 7316 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.335 |
| Bottom | 2514 | 1.05 | 0.358 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1099.0767 | 21.9815 | 58.3034 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1122.9197 | -22.4584 | -80.4543 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.8726 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.8726 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8147 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.8147 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C38 | 7319 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.345 |
| Bottom | 2514 | 1.05 | 0.371 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1131.8658 | -22.6373 | 60.4696 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1155.7088 | 23.1142 | -86.9047 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.5281 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.5281 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.8916 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.8916 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C39 | 7322 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.166 |
| Bottom | 5182 | 0.93 | 0.172 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1336.0627 | -26.7213 | 84.9919 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1369.4429 | -27.3889 | 96.292 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.6215 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 7.6215 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.5603 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.5603 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C40 | 7324 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.179 |
| Bottom | 5182 | 0.93 | 0.182 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1436.0643 | 28.7213 | 4.5693 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1469.4444 | 29.3889 | 15.9775 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.7854 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 6.7854 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 11.7438 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 11.7438 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C41 | 7326 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.165 |
| Bottom | 5182 | 0.93 | 0.17 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1321.3132 | -26.4263 | -83.8684 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1354.6934 | -27.0939 | -95.863 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.8484 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 7.8484 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.5511 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.5511 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C42 | 7328 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 56.7 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5182 | 0.93 | 0.168 |
| Bottom | 5182 | 0.93 | 0.171 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1352.1232 | -27.0425 | -5.1132 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1385.5034 | 27.7101 | -26.3086 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.4015 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 8.4015 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.7537 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.7537 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C43 | 7330 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.494 |
| Bottom | 2514 | 1.05 | 0.502 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1693.0679 | -33.8614 | -37.7596 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 1716.9109 | 34.3382 | 56.4716 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.8012 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.8012 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7519 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.7519 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C44 | 7332 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2514 | 1.05 | 0.344 |
| Bottom | 2514 | 1.05 | 0.372 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1130.6123 | -22.6122 | -59.7098 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1154.4553 | 23.0891 | 88.0993 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.995 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.995 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0742 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.0742 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C1 | 7351 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.101 |
| Bottom | 3770 | 0.77 | 0.086 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 175.9449 | -28.3805 | -71.5371 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 232.8906 | 46.3796 | 46.8775 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.766 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.766 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 20.2714 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 20.2714 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C2 | 7352 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.161 |
| Bottom | 3770 | 0.77 | 0.072 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 200.2527 | 114.9271 | -23.7762 | 3100 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 418.9717 | 36.4908 | 12.3736 | 1240 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.8368 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.8368 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 40.3425 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 40.3425 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C3 | 7353 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.109 |
| Bottom | 3770 | 0.77 | 0.079 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 172.6347 | -30.4393 | 75.0852 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 270.2544 | 40.1118 | -43.9053 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 23.7245 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 23.7245 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.7062 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.7062 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C4 | 7354 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.163 |
| Bottom | 3770 | 0.77 | 0.071 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 192.8498 | 113.7999 | 26.7248 | 3100 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 432.8513 | -26.3185 | -20.1754 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.1041 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.1041 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 40.6751 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 40.6751 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C5 | 7355 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.105 |
| Bottom | 3770 | 0.77 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 168.3929 | 20.6045 | -77.5394 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 271.1555 | -31.3201 | 37.9525 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.9148 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 21.9148 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4512 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.4512 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C6 | 7356 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.228 |
| Bottom | 3770 | 0.77 | 0.08 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 195.0691 | -35.0987 | -148.2862 | 3100 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 399.3577 | 11.7944 | -51.8142 | 1240 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.1753 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.1753 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 41.7255 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 41.7255 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C7 | 7357 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.214 |
| Bottom | 3770 | 0.77 | 0.105 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 185.3007 | 61.2869 | 124.7379 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 242.2464 | -52.9465 | -58.2969 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 34.2508 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 34.2508 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 32.3413 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 32.3413 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C8 | 7358 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.238 |
| Bottom | 3770 | 0.77 | 0.087 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 339.893 | -51.0808 | 167.2773 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 436.9897 | 37.5722 | -40.6787 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 32.697 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 32.697 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 43.5853 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 43.5853 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C9 | 7359 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.227 |
| Bottom | 3218 | 0.89 | 0.232 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1148.935 | 43.1989 | -30.1021 | 3100 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1182.4051 | -39.7269 | -30.979 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.4632 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.4632 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.8106 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.8106 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C10 | 7360 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.289 |
| Bottom | 3218 | 0.89 | 0.298 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1496.431 | -1.2618 | -39.2065 | 1860 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1483.1378 | -62.2665 | 38.8582 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.7238 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.7238 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.2302 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.2302 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C11 | 7361 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.208 |
| Bottom | 3218 | 0.89 | 0.164 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 804.0033 | 85.7487 | -21.0649 | 3100 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 824.0854 | 32.5193 | 21.591 | 1240 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.647 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.647 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 19.2138 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 19.2138 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C12 | 7362 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.191 |
| Bottom | 3218 | 0.89 | 0.173 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 836.8813 | 62.7724 | -21.9263 | 3100 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 870.3515 | 33.5176 | 22.8032 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.6271 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.6271 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.795 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 13.795 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C13 | 7591 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.602 |
| Bottom | 2060 | 0.86 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 211.0964 | -17.826 | 217.3624 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 234.4895 | 29.7423 | -81.6487 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 98.6406 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 98.6406 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.2713 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.2713 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C14 | 7593 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.115 |
| Bottom | 2060 | 0.86 | 0.104 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 92.1336 | -1.8427 | 49.8016 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 115.9766 | 2.3195 | -47.1839 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.2935 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 20.2935 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2111 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2111 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C15 | 7596 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.135 |
| Bottom | 2060 | 0.86 | 0.195 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 239.692 | 13.848 | 39.6832 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 166.2457 | -14.5697 | -69.2762 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.6717 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.6717 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0278 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 10.0278 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C16 | 7598 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.436 |
| Bottom | 2060 | 0.86 | 0.261 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 136.4425 | -12.4368 | 154.2264 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 159.8356 | 14.9257 | -93.6113 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 82.0462 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 82.0462 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7127 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.7127 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C18 | 7600 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.094 |
| Bottom | 2060 | 0.86 | 0.087 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 47.1241 | 0.984 | -37.9919 | 2650 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 141.9783 | 2.8396 | 38.6794 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.7181 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 13.7181 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.1714 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.1714 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C17 | 7603 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.217 |
| Bottom | 2060 | 0.86 | 0.13 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 152.6584 | -11.775 | 82.0285 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 224.0357 | 13.8103 | -37.5175 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 32.6609 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 32.6609 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.9087 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.9087 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C20 | 7606 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.597 |
| Bottom | 2060 | 0.86 | 0.285 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 217.2753 | 15.5349 | 219.1214 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 246.9126 | -31.1104 | -77.1537 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 97.3724 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 97.3724 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.6403 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.6403 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C19 | 7608 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.21 |
| Bottom | 2060 | 0.86 | 0.127 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 156.3749 | 8.961 | 84.2969 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 227.9146 | -11.537 | -41.0985 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 34.8669 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 34.8669 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0612 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.0612 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C21 | 7611 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.616 |
| Bottom | 2060 | 0.86 | 0.294 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 220.1256 | -15.8125 | -225.281 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 243.5186 | 28.8861 | 86.9022 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 102.9589 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 102.9589 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.5124 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 15.5124 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C22 | 7613 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.127 |
| Bottom | 2060 | 0.86 | 0.084 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 47.2359 | 0.9447 | 48.1517 | 2650 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 148.7365 | 2.9747 | -35.8689 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.3348 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 16.3348 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.0967 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.0967 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C23 | 7616 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.474 |
| Bottom | 2060 | 0.86 | 0.263 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 139.5355 | 11.6263 | -167.5134 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 162.9286 | -13.9241 | 96.4947 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 88.6844 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 88.6844 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.0935 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.0935 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C24 | 7618 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.156 |
| Bottom | 2060 | 0.86 | 0.107 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 115.9191 | -2.3184 | -66.8306 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 175.1574 | -3.5031 | 47.6245 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.7423 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 26.7423 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.174 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.174 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C25 | 7622 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.125 |
| Bottom | 2060 | 0.86 | 0.185 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 262.3277 | -14.4279 | -30.1778 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 198.0781 | 13.7435 | 68.0174 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 33.9795 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 33.9795 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7413 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.7413 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C26 | 7624 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.602 |
| Bottom | 2060 | 0.86 | 0.286 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 235.3944 | 19.6425 | -219.5372 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 265.3803 | -29.9153 | 81.979 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 100.2157 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 100.2157 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 16.6821 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 16.6821 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C27 | 7626 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.214 |
| Bottom | 2060 | 0.86 | 0.134 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 156.6522 | 10.5644 | -83.4981 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 228.1489 | -12.5462 | 43.156 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.4146 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 37.4146 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.0722 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.0722 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C28 | 7630 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.237 |
| Bottom | 2060 | 0.86 | 0.139 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.6374 | -9.783 | -92.8701 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 229.7812 | 11.9084 | 47.8077 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.1004 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.1004 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4979 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.4979 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C29 | 7634 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.216 |
| Bottom | 2060 | 0.86 | 0.191 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 127.5828 | -17.161 | -68.5823 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 150.9759 | 17.535 | -59.109 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.4306 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 40.4306 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.139 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.139 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C30 | 7636 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.196 |
| Bottom | 2060 | 0.86 | 0.192 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 65.9058 | 11.2264 | 62.282 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 153.6023 | -16.5588 | -62.7585 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.282 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.282 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4466 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.4466 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C31 | 7638 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.226 |
| Bottom | 2060 | 0.86 | 0.236 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 138.5214 | -19.69 | -68.0967 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 161.9145 | 19.6629 | 76.5171 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.7621 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 51.7621 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.5705 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 13.5705 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C32 | 7640 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.196 |
| Bottom | 2060 | 0.86 | 0.205 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 68.7943 | 11.366 | -62.5097 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 157.8863 | -16.7805 | 68.6656 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.3956 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.3956 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.5331 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.5331 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C33 | 7642 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.298 |
| Bottom | 3142 | 1.05 | 0.357 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1180.8277 | 33.3134 | -45.5898 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 1210.069 | -49.4351 | 97.2112 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 63.6368 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 63.6368 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 18.2111 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 18.2111 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C35 | 7648 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.256 |
| Bottom | 3142 | 1.05 | 0.26 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 963.3433 | -20.6082 | -101.4018 | 2600 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 986.7364 | 24.9178 | 88.6997 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 85.8301 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 85.8301 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.3511 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.3511 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C34 | 7650 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.217 |
| Bottom | 3142 | 1.05 | 0.231 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 840.2878 | 22.8463 | 57.9756 | 2600 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 863.6808 | -27.7783 | -52.9226 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.2468 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.2468 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.0196 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.0196 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C36 | 7654 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.243 |
| Bottom | 3142 | 1.05 | 0.26 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 996.7764 | -21.1025 | 60.695 | 2600 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1020.1695 | 26.8191 | -62.9029 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.2799 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 53.2799 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.8267 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.8267 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C37 | 7658 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.674 |
| Bottom | 2060 | 0.86 | 0.325 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 155.1775 | 71.8444 | 109.9216 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 178.5706 | -39.9411 | -59.0664 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 74.5221 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 74.5221 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.1471 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.1471 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C38 | 7661 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.663 |
| Bottom | 2060 | 0.86 | 0.324 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 160.2349 | -71.3653 | 107.282 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 183.6279 | 39.6564 | -61.785 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 79.1998 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 79.1998 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.5688 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.5688 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C39 | 7664 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.499 |
| Bottom | 4553 | 0.81 | 0.112 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 213.6516 | 184.142 | -26.874 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 467.9901 | -60.0083 | 26.0186 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 15.4367 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 15.4367 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 77.5239 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 77.5239 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C40 | 7666 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.504 |
| Bottom | 4553 | 0.81 | 0.131 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 247.6255 | -190.761 | -27.7006 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 527.9608 | 71.5966 | 27.3836 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 15.2247 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 15.2247 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 85.163 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 85.163 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C41 | 7668 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.517 |
| Bottom | 4553 | 0.81 | 0.115 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 212.1244 | 189.617 | 27.6234 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 467.613 | -62.3763 | -24.2535 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 14.3897 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 14.3897 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 80.1805 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 80.1805 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C42 | 7670 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.521 |
| Bottom | 4553 | 0.81 | 0.121 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 221.4808 | -191.7375 | 36.1375 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 483.6228 | 66.1894 | -25.0839 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 17.9611 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 17.9611 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 83.1072 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 83.1072 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C43 | 7672 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.291 |
| Bottom | 2060 | 0.86 | 0.296 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 895.5283 | 17.9106 | 54.7845 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 918.9214 | -23.367 | 34.0974 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.9115 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.9115 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.8631 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.8631 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C44 | 7674 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.554 |
| Bottom | 2060 | 0.86 | 0.304 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 182.7622 | -56.6327 | -117.3442 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 206.1553 | 35.9687 | 71.0071 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 82.7489 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 82.7489 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.7325 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.7325 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C2 | 7689 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.143 |
| Bottom | 3770 | 0.77 | 0.202 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 92.2589 | -4.6719 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 115.9488 | 126.7577 | -6.3378 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6756 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.6756 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.2126 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.2126 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C4 | 7690 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.143 |
| Bottom | 3770 | 0.77 | 0.201 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 92.8597 | -3.0616 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 115.9488 | 127.5863 | -4.127 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4355 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.4355 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.3144 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.3144 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C6 | 7691 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.201 |
| Bottom | 3770 | 0.77 | 0.277 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 16.8018 | -117.8608 | 1920 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 115.9488 | 22.7982 | -159.7534 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5834 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.5834 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1894 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.1894 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C8 | 7692 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.196 |
| Bottom | 3770 | 0.77 | 0.27 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 17.0892 | 115.2341 | 1920 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 115.9488 | 23.2039 | 156.2863 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3346 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.3346 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1548 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.1548 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C9 | 7693 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.235 |
| Bottom | 3218 | 0.89 | 0.199 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 879.7207 | 100.9207 | -23.2246 | 3200 | 202] 1.5 [DL + RSX] |
| Bottom | 1019.7885 | -32.7076 | 26.9224 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.0333 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.0333 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.1286 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 15.1286 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C10 | 7694 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.53 |
| Bottom | 3218 | 0.89 | 0.303 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1260.9132 | 292.8599 | -44.7206 | 3200 | 202] 1.5 [DL + RSX] |
| Bottom | 1304.1005 | -102.7069 | 36.623 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 24.453 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 24.453 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 83.4861 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 83.4861 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C11 | 7695 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.263 |
| Bottom | 3218 | 0.89 | 0.384 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 610.7881 | 105.0546 | -81.3969 | 1920 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 631.518 | 178.3994 | -84.1595 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.6159 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.6159 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 28.6886 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 28.6886 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C12 | 7696 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.278 |
| Bottom | 3218 | 0.89 | 0.359 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 683.9445 | 104.4654 | 91.1461 | 1920 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 704.6744 | 154.8912 | 97.2917 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 14.3079 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 14.3079 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.6094 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.6094 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C13 | 7824 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.663 |
| Bottom | 2060 | 0.86 | 0.626 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 52.0365 | 1.0407 | 213.7867 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 66.6122 | 4.3352 | 206.0685 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.2193 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 4.2193 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7558 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.7558 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C14 | 7826 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.059 |
| Bottom | 2060 | 0.86 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 25.2001 | 2.8109 | 20.6252 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 39.7758 | 5.7228 | 20.7654 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0701 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0701 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4022 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4022 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C15 | 7829 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.547 |
| Bottom | 2060 | 0.86 | 0.175 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 33.4606 | -0.6692 | 173.6646 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 57.7534 | -1.6579 | -64.7069 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 73.5251 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 73.5251 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4432 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4432 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C16 | 7831 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.534 |
| Bottom | 2060 | 0.86 | 0.397 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.3365 | 0.8793 | 165.4889 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 33.9122 | 3.8078 | 128.1604 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.5341 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 19.5341 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.5115 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.5115 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C18 | 7833 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.059 |
| Bottom | 2060 | 0.86 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 25.2001 | 2.8427 | -20.5817 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 39.7758 | 5.7849 | -20.6814 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0455 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0455 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4198 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4198 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C17 | 7836 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.114 |
| Bottom | 2060 | 0.86 | 0.083 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2.2306 | -0.2329 | 34.9429 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 11.19 | -1.1349 | -27.2481 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.075 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.075 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.347 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.347 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C20 | 7839 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.692 |
| Bottom | 2060 | 0.86 | 0.648 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 56.7721 | -1.3242 | 223.7838 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 72.2784 | -6.7572 | 212.0818 | 1080 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.1598 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.1598 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.1912 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.1912 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C19 | 7841 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.117 |
| Bottom | 2060 | 0.86 | 0.086 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2.682 | 0.2225 | 35.8881 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 11.2823 | 1.1574 | -28.1281 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.0761 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.0761 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3235 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3235 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C21 | 7844 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.703 |
| Bottom | 2060 | 0.86 | 0.663 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 58.0467 | 1.404 | -227.2702 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 73.4979 | 8.3427 | -215.6085 | 1080 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.3762 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.3762 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.3083 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.3083 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C22 | 7846 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.06 |
| Bottom | 2060 | 0.86 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 25.2151 | 0.5829 | 23.3619 | 1620 | 202] 1.5 [DL + RSX] |
| Bottom | 39.7908 | 5.7158 | 20.7454 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0614 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0614 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4014 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4014 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C23 | 7849 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.589 |
| Bottom | 2060 | 0.86 | 0.441 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.4843 | -0.7791 | -182.968 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 37.06 | -1.886 | -142.8769 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.0885 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 21.0885 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3218 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3218 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C24 | 7851 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.06 |
| Bottom | 2060 | 0.86 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 25.2001 | 0.6021 | -23.3612 | 1620 | 202] 1.5 [DL + RSX] |
| Bottom | 39.7758 | 5.7877 | -20.652 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0395 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0395 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4208 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4208 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C25 | 7855 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.672 |
| Bottom | 2060 | 0.86 | 0.208 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 56.5466 | 1.1309 | -217.7327 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 80.8395 | 2.2756 | 79.3628 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 96.4091 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 96.4091 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6096 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6096 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C26 | 7857 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.678 |
| Bottom | 2060 | 0.86 | 0.65 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 57.1765 | -2.008 | -219.4487 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 71.7522 | -8.5577 | -210.8767 | 1080 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.7087 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 5.7087 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.5546 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.5546 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C27 | 7859 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.119 |
| Bottom | 2060 | 0.86 | 0.085 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2.6965 | 0.2276 | -36.2921 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 11.2579 | 1.1497 | 27.905 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.9394 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 5.9394 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3477 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3477 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C28 | 7863 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.129 |
| Bottom | 2060 | 0.86 | 0.089 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3.6352 | -0.221 | -39.78 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 5.8472 | 0.1856 | -28.4807 | 1080 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.8745 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 5.8745 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3325 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3325 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C29 | 7867 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.131 |
| Bottom | 2060 | 0.86 | 0.139 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4.9594 | 0.6993 | -40.5183 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 19.5351 | 1.4106 | -46.2951 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0648 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.0648 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3363 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3363 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C30 | 7869 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.116 |
| Bottom | 2060 | 0.86 | 0.126 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6.616 | -0.7156 | -36.6458 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 21.1917 | -1.4422 | -42.5193 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0569 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.0569 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3506 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3506 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C31 | 7871 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.104 |
| Bottom | 2060 | 0.86 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6.6408 | 0.7643 | 33.1224 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 21.2165 | 1.542 | 40.007 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.3039 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.3039 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3645 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3645 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C32 | 7873 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.115 |
| Bottom | 2060 | 0.86 | 0.126 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6.7794 | -0.6773 | 36.4258 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 21.3551 | -1.3642 | 42.4869 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.2142 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.2142 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3157 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3157 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C33 | 7875 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.407 |
| Bottom | 3142 | 1.05 | 0.369 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1004.8486 | 40.7371 | -231.9907 | 2500 | 203] 1.5 [DL + RSY] |
| Bottom | 1079.8684 | -56.333 | 127.8078 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 140.846 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 140.846 | 1000 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 28.2622 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 28.2622 | 1000 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C35 | 7881 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.786 |
| Bottom | 3142 | 1.05 | 0.733 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 858.8013 | -169.505 | 117.2466 | 2700 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 873.377 | 172.3819 | 51.769 | 1080 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.3469 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 55.3469 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.3278 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.3278 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C34 | 7883 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.633 |
| Bottom | 3142 | 1.05 | 0.629 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 728.3003 | -143.7476 | 65.0942 | 2700 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 752.5932 | -148.5423 | -42.3372 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.7604 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.7604 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.8255 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 6.8255 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C36 | 7887 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.245 |
| Bottom | 3142 | 1.05 | 0.233 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 808.9329 | -21.9351 | -116.4108 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 925.1925 | 23.9768 | -51.6317 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.6381 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 19.6381 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.9724 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.9724 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C37 | 7891 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.839 |
| Bottom | 2060 | 0.86 | 0.897 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 50.5047 | -82.9345 | 83.8613 | 1620 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 59.2501 | -90.3956 | 72.1653 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.531 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.531 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.001 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.001 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C38 | 7893 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.834 |
| Bottom | 2060 | 0.86 | 0.896 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.3739 | 82.8083 | 77.5085 | 1620 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 58.1193 | 90.2685 | 69.8861 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.2281 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.2281 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8096 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.8096 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C39 | 7895 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.537 |
| Bottom | 4553 | 0.81 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 181.4834 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 238.7041 | -7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0747 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0747 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.6156 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.6156 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C40 | 7896 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.537 |
| Bottom | 4553 | 0.81 | 0.711 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 181.4668 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 238.6807 | -7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0939 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0939 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.6181 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.6181 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C41 | 7897 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.55 |
| Bottom | 4553 | 0.81 | 0.728 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 185.569 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 243.9998 | -7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.084 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.084 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.1233 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.1233 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C42 | 7898 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.549 |
| Bottom | 4553 | 0.81 | 0.727 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 185.3211 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 243.6735 | 7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0984 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0984 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.0958 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.0958 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C43 | 7899 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.604 |
| Bottom | 2060 | 0.86 | 0.353 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 672.4108 | 57.4219 | -194.1829 | 2500 | 202] 1.5 [DL + RSX] |
| Bottom | 842.2884 | -35.2095 | 84.2975 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 110.2417 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 110.2417 | 1000 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.5793 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.5793 | 1000 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C44 | 7900 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.629 |
| Bottom | 2060 | 0.86 | 0.65 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 73.245 | 55.1835 | -131.8463 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 57.7941 | 65.9498 | -65.8268 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.3897 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 17.3897 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.1904 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.1904 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C2 | 7922 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.065 |
| Bottom | 3770 | 0.77 | 0.105 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 44.8735 | -2.3328 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 80.6792 | 69.2876 | -3.5648 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5424 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.5424 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8886 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.8886 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C4 | 7923 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.065 |
| Bottom | 3770 | 0.77 | 0.105 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 45.1628 | -1.7882 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 80.6792 | 69.7342 | -2.3585 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3561 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.3561 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9641 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.9641 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C6 | 7924 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.095 |
| Bottom | 3770 | 0.77 | 0.15 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 8.3957 | -59.0198 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 80.6792 | 12.8111 | -89.9804 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4678 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.4678 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8708 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.8708 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C8 | 7925 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.093 |
| Bottom | 3770 | 0.77 | 0.146 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 8.5279 | 57.6358 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 80.6792 | 13.0194 | 87.9141 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2649 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.2649 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8265 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.8265 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C9 | 7926 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.185 |
| Bottom | 3218 | 0.89 | 0.348 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 571.5336 | -75.5133 | 45.318 | 1770 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 590.6439 | -178.8863 | 51.109 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.916 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.916 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 47.2424 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 47.2424 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C10 | 7927 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.255 |
| Bottom | 3218 | 0.89 | 0.488 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 417.8687 | -120.4935 | 52.4489 | 1770 | 202] 1.5 [DL + RSX] |
| Bottom | 412.3061 | -206.149 | 93.8137 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 28.0196 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 28.0196 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 39.4307 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 39.4307 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C11 | 7928 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.345 |
| Bottom | 3218 | 0.89 | 0.251 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 565.1176 | -160.2527 | -75.3106 | 2950 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 584.2279 | -100.1622 | 77.8573 | 1180 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.4519 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.4519 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 28.6712 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 28.6712 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C12 | 7929 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.316 |
| Bottom | 3218 | 0.89 | 0.26 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 672.5401 | -122.5998 | -103.5964 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 691.6504 | -87.4258 | 92.173 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.2261 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.2261 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.5781 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.5781 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C33 | 7982 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.483 |
| Bottom | 3142 | 1.05 | 0.582 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 677.2589 | -83.2874 | 185.331 | 1470 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 507.4482 | -89.5461 | 240.2076 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 39.2115 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 39.2115 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.5626 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.5626 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C35 | 7987 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.724 |
| Bottom | 3142 | 1.05 | 0.724 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 642.1865 | 132.9916 | 192.9875 | 2450 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 664.23 | -131.1017 | -210.181 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 160.7625 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 160.7625 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.4603 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.4603 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C34 | 7989 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.66 |
| Bottom | 3142 | 1.05 | 0.541 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 608.2591 | -127.198 | -149.1626 | 2450 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 630.3026 | -124.4053 | 49.7857 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 79.0235 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 79.0235 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.5798 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.5798 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C36 | 7992 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.197 |
| Bottom | 3142 | 1.05 | 0.215 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 602.0319 | 21.0256 | -94.2205 | 2450 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 486.1805 | 19.2615 | 133.3232 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 87.2818 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 87.2818 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.3697 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 6.3697 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C37 | 7996 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.482 |
| Bottom | 2060 | 0.86 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | 51.1377 | 2.8381 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | 75.6497 | 4.516 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.853 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.853 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4871 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4871 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C38 | 7997 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.481 |
| Bottom | 2060 | 0.86 | 0.717 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | -51.0263 | 3.286 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | -75.4809 | 5.1875 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.8355 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.8355 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5416 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5416 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C39 | 7998 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.28 |
| Bottom | 4553 | 0.81 | 0.421 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 96.4386 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 143.2812 | -4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0522 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0522 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 20.7697 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 20.7697 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C40 | 7999 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.28 |
| Bottom | 4553 | 0.81 | 0.421 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 96.4302 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 143.2677 | -4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0683 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0683 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 20.7709 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 20.7709 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C41 | 8000 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.287 |
| Bottom | 4553 | 0.81 | 0.431 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 98.6651 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 146.5548 | -4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0607 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0607 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 21.2395 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 21.2395 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C42 | 8001 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.286 |
| Bottom | 4553 | 0.81 | 0.431 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 98.5333 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 146.3582 | -4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0705 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0705 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 21.214 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 21.214 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C43 | 8002 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.193 |
| Bottom | 2060 | 0.86 | 0.284 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | 22.088 | -2.6329 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | 32.057 | -4.1573 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.4976 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.4976 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6559 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6559 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C44 | 8003 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.331 |
| Bottom | 2060 | 0.86 | 0.495 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | -35.8969 | -4.1052 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | -53.1551 | -6.4017 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.88 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.88 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5635 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5635 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C2 | 8029 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.015 |
| Bottom | 3770 | 0.77 | 0.039 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 11.3881 | -0.6179 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 48.165 | 28.6498 | 1.5448 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2724 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.2724 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1893 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1893 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C4 | 8030 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.015 |
| Bottom | 3770 | 0.77 | 0.039 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 11.4631 | 0.6179 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 48.165 | 28.8325 | 1.5448 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1833 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.1833 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2242 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2242 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C6 | 8031 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.023 |
| Bottom | 3770 | 0.77 | 0.059 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 2.1716 | -15.2959 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 48.165 | 5.4626 | -38.4484 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2347 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.2347 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1808 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1808 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C8 | 8032 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3770 | 0.77 | 0.023 |
| Bottom | 3770 | 0.77 | 0.057 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 2.2046 | 14.9258 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 48.165 | 5.5438 | 37.5186 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1319 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.1319 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1499 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1499 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C9 | 8033 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.636 |
| Bottom | 3218 | 0.89 | 0.294 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 416.1536 | 292.8361 | -42.7013 | 4370 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 539.9205 | 152.5207 | -42.8114 | 1748 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.1378 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.1378 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 47.2383 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 47.2383 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C10 | 8034 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.491 |
| Bottom | 3218 | 0.89 | 0.236 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 499.4625 | 184.6372 | -139.3234 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 622.0461 | 87.406 | -75.948 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 25.5111 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 25.5111 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 39.4219 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 39.4219 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C11 | 8035 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.634 |
| Bottom | 3218 | 0.89 | 0.446 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 517.9355 | -296.7431 | 71.0181 | 4370 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 546.2447 | -215.499 | 72.7955 | 1748 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.7621 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.7621 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 28.6367 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 28.6367 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C12 | 8036 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 56.3 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3218 | 0.89 | 0.517 |
| Bottom | 3218 | 0.89 | 0.398 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 625.358 | -207.0255 | -143.8153 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 653.6672 | -156.841 | -119.8466 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.7845 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.7845 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.5207 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.5207 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C33 | 8084 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.754 |
| Bottom | 3142 | 1.05 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 403.6587 | 119.0878 | -223.3473 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 434.2956 | 58.2989 | -133.4222 | 1548 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 32.0205 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 32.0205 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 29.132 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 29.132 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C35 | 8089 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.993 |
| Bottom | 3142 | 1.05 | 0.545 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 377.7966 | -161.8516 | -207.6215 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 434.0545 | 103.1778 | -109.6547 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.2845 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 30.2845 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 33.1458 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 33.1458 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C34 | 8091 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 1.01 |
| Bottom | 3142 | 1.05 | 0.565 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 448.1492 | 182.774 | 112.4188 | 3870 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 482.9689 | -112.1297 | 95.1982 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.3879 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 22.3879 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 29.7758 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 29.7758 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C36 | 8094 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 55 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3142 | 1.05 | 0.724 |
| Bottom | 3142 | 1.05 | 0.279 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 281.2314 | -118.5033 | 151.0915 | 3870 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 130.3701 | 47.3803 | 55.9078 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.2507 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 43.2507 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 34.0966 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 34.0966 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C37 | 8098 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.131 |
| Bottom | 2060 | 0.86 | 0.333 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | 14.0642 | 0.6737 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | 35.5974 | 1.7351 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.716 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.716 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2766 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.2766 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C38 | 8099 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.131 |
| Bottom | 2060 | 0.86 | 0.332 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | -14.0363 | 0.7942 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | -35.5231 | 2.0336 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.6986 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.6986 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3109 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3109 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C39 | 8100 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.074 |
| Bottom | 4553 | 0.81 | 0.186 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 25.9027 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 65.3335 | 3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0219 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0219 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 11.7788 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 11.7788 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C40 | 8101 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.074 |
| Bottom | 4553 | 0.81 | 0.186 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 25.9019 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 65.3275 | -3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0304 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0304 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 11.7789 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 11.7789 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C41 | 8102 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.076 |
| Bottom | 4553 | 0.81 | 0.191 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 26.5114 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 66.862 | -3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0267 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0267 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 12.0564 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 12.0564 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C42 | 8103 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 57 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4553 | 0.81 | 0.075 |
| Bottom | 4553 | 0.81 | 0.191 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 26.4772 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 66.7722 | -3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0306 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0306 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 12.0413 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 12.0413 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C43 | 8104 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.056 |
| Bottom | 2060 | 0.86 | 0.14 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | 6.449 | -0.6428 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | 16.2152 | -1.6246 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.5093 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.5093 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4491 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4491 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C44 | 8105 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 54.1 | 25 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2060 | 0.86 | 0.09 |
| Bottom | 2060 | 0.86 | 0.229 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | -9.9477 | -1.0179 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | -25.181 | -2.588 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.7243 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.7243 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3205 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3205 | 1748 | 205] 1.2 [DL + LL + RSY] |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Shear Wall Design

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.483 | 202] 1.5 [DL + RSX] | 1451.5903 | -68.4065 | -208.8197 |
| Bottom | 0.415 | 202] 1.5 [DL + RSX] | 1494.1027 | 63.352 | 32.3843 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1330.0862 | -163.2849 | 77.5725 | 122.1259 | 381.952 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1372.5986 | 43.4684 | 77.5375 | 123.179 | 383.0051 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1494.84 | -163.2849 | 6.42 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1537.3524 | -29.3678 | 4.68 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1537.3524 | 43.4684 | 4.87 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.46 | 202] 1.5 [DL + RSX] | 1665.9077 | -62.1246 | 106.3729 |
| Bottom | 0.456 | 202] 1.5 [DL + RSX] | 1708.4201 | 62.4764 | -54.6308 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1500.182 | 117.2874 | -52.0104 | 126.3394 | 386.1655 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1542.6944 | 14.5465 | -52.1457 | 127.3925 | 387.2186 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1068.3432 | -7.1586 | 3.07 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1710.4745 | 117.2874 | 6.38 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1752.9869 | -71.7488 | 5.87 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1752.9869 | 14.5465 | 5.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.499 | 202] 1.5 [DL + RSX] | 1885.3192 | -64.8528 | 80.2937 |
| Bottom | 0.498 | 202] 1.5 [DL + RSX] | 1927.8317 | 63.9032 | -56.949 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1672.1672 | 87.5361 | -42.8812 | 130.5998 | 390.4259 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1714.6796 | 13.9316 | -43.0536 | 131.6529 | 391.479 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1927.4588 | -12.5738 | 5.53 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1927.4588 | 87.5361 | 6.57 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1969.9713 | -79.1426 | 6.57 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1969.9713 | 13.9316 | 5.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 202] 1.5 [DL + RSX] | 2107.0851 | -66.9031 | 80.6368 |
| Bottom | 0.541 | 202] 1.5 [DL + RSX] | 2149.5975 | 65.7176 | -56.9149 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1845.5732 | 85.9485 | -41.7628 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1888.0857 | 15.628 | -41.9977 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2145.2421 | -16.8076 | 6.19 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2145.2421 | 85.9485 | 7.15 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2187.7546 | -81.0158 | 7.2 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2187.7546 | 15.628 | 6.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.588 | 202] 1.5 [DL + RSX] | 2330.3356 | -68.8724 | 83.0963 |
| Bottom | 0.585 | 202] 1.5 [DL + RSX] | 2372.8481 | 67.5954 | -58.4737 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2020.2475 | 87.0584 | -41.5869 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2062.7599 | 15.835 | -41.8986 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2363.592 | -17.1177 | 6.8 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2363.592 | 87.0584 | 7.77 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2406.1045 | -81.5925 | 7.82 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2406.1045 | 15.835 | 6.9 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.632 | 202] 1.5 [DL + RSX] | 2554.6141 | -70.7504 | 84.857 |
| Bottom | 0.63 | 202] 1.5 [DL + RSX] | 2597.1266 | 69.4498 | -60.4352 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2195.9435 | 87.4811 | -41.4544 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2238.456 | 15.6403 | -41.8216 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2582.2904 | -17.4028 | 7.41 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2582.2904 | 87.4811 | 8.39 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2624.8028 | -81.5319 | 8.42 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2624.8028 | 15.6403 | 7.51 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.641 | 202] 1.5 [DL + RSX] | 2779.5632 | -72.5333 | 86.1187 |
| Bottom | 0.644 | 202] 1.5 [DL + RSX] | 2822.0757 | 71.2619 | -62.3008 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2372.3968 | 87.27 | -41.3922 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2414.9092 | 15.6353 | -41.7745 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2801.1339 | -17.2775 | 8.02 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2801.1339 | 87.27 | 8.99 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2843.6463 | -81.513 | 9.03 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2843.6463 | 15.6353 | 8.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.685 | 202] 1.5 [DL + RSX] | 3004.8605 | -74.1499 | 86.4178 |
| Bottom | 0.689 | 202] 1.5 [DL + RSX] | 3047.373 | 72.9754 | -64.5429 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2549.3553 | 86.4102 | -41.274 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2591.8678 | 15.898 | -41.6277 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3019.913 | -16.8223 | 8.62 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3019.913 | 86.4102 | 9.59 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3062.4254 | -81.8746 | 9.64 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3062.4254 | 15.898 | 8.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.748 | 202] 1.5 [DL + RSX] | 3230.1794 | -75.5306 | 85.1661 |
| Bottom | 0.752 | 202] 1.5 [DL + RSX] | 3272.6918 | 74.6204 | -67.243 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2734.7967 | 85.1661 | -40.8889 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2777.3091 | 2.8884 | -41.0419 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3238.3839 | -16.5673 | 9.23 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3238.3839 | 85.1194 | 10.18 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3280.8964 | -81.6892 | 10.25 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3280.8964 | 17.3347 | 9.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.792 | 202] 1.5 [DL + RSX] | 3455.1511 | -76.3928 | 82.8955 |
| Bottom | 0.797 | 202] 1.5 [DL + RSX] | 3497.6636 | 75.5323 | -70.1554 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2904.9638 | 82.8955 | -41.0352 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2947.4762 | 10.9257 | -41.1729 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3456.2251 | -16.0526 | 9.82 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3456.2251 | 84.8813 | 10.78 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3498.7376 | -80.0881 | 10.83 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3498.7376 | 20.8585 | 10.01 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.815 | 202] 1.5 [DL + RSX] | 3679.6401 | -77.5991 | 80.3872 |
| Bottom | 0.827 | 202] 1.5 [DL + RSX] | 3722.1525 | 77.1507 | -118.0264 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3075.0209 | 80.3872 | -55.064 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3117.5333 | -20.1556 | -55.1908 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3679.6401 | -7.9179 | 10.33 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3679.6401 | 80.3872 | 11.34 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3722.1525 | -20.1556 | 10.62 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2354.2153 | 7.4808 | 6.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.85 | 202] 1.5 [DL + RSX] | 3903.9706 | -77.9985 | -44.1677 |
| Bottom | 0.906 | 202] 1.5 [DL + RSX] | 3946.4831 | 83.5428 | 273.4192 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3245.035 | 31.5757 | 92.5018 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3287.5474 | 273.4192 | 92.6129 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3903.9706 | -44.1677 | 11.46 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3903.9706 | 31.5757 | 11.28 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3946.4831 | 273.4192 | 14.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.839 | 202] 1.5 [DL + RSX] | 4138.1847 | -138.7885 | -902.4081 |
| Bottom | 0.705 | 202] 1.5 [DL + RSX] | 4201.9533 | 133.1322 | -120.5874 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3399.9293 | -710.6709 | 291.9187 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3463.6979 | 85.4512 | 292.0566 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4138.1847 | -710.6709 | 12.05 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4201.9533 | -120.5874 | 8.53 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4201.9533 | 85.4512 | 8.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.736 | 202] 1.5 [DL + RSX] | 4421.5157 | -136.0563 | 130.5944 |
| Bottom | 0.741 | 202] 1.5 [DL + RSX] | 4485.2843 | 136.2529 | -109.4711 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3591.4979 | 171.1278 | -70.4824 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3655.2666 | 138.4504 | -70.843 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4421.5157 | -1.2881 | 8.2 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4421.5157 | 130.5944 | 8.99 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4485.2843 | -109.4711 | 8.98 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4485.2843 | 81.3049 | 8.81 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.765 | 202] 1.5 [DL + RSX] | 4703.412 | -130.6638 | 138.6163 |
| Bottom | 0.775 | 202] 1.5 [DL + RSX] | 4767.1807 | 132.8713 | -126.7658 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3760.788 | 180.4399 | -80.5777 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3824.5567 | 123.0158 | -81.1899 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4703.412 | -5.9594 | 8.75 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4703.412 | 138.6163 | 9.57 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4767.1807 | -126.7658 | 9.61 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4767.1807 | 53.7979 | 9.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.797 | 202] 1.5 [DL + RSX] | 4982.2088 | -128.7402 | 115.5038 |
| Bottom | 0.808 | 202] 1.5 [DL + RSX] | 5045.9775 | 130.6936 | -124.4076 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3927.2387 | 153.7957 | -72.8493 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3991.0073 | 133.2772 | -73.6694 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4984.1001 | -70.0444 | 9.66 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4984.1001 | 153.7957 | 10.18 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5047.8688 | -201.8309 | 10.59 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5047.8688 | 133.2772 | 10.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.829 | 202] 1.5 [DL + RSX] | 5258.0394 | -125.9457 | 111.1458 |
| Bottom | 0.841 | 202] 1.5 [DL + RSX] | 5321.8081 | 128.3496 | -129.0589 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4091.9633 | 146.1786 | -72.5207 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4155.732 | 145.4653 | -73.476 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5268.0688 | -63.156 | 10.15 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5268.0688 | 146.1786 | 10.66 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5331.8375 | -211.0271 | 11.18 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5331.8375 | 145.4653 | 10.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.859 | 202] 1.5 [DL + RSX] | 5530.5863 | -122.3818 | 101.4804 |
| Bottom | 0.874 | 202] 1.5 [DL + RSX] | 5594.355 | 125.3903 | -142.6848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4255.7087 | 136.7606 | -72.13 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4319.4774 | 159.8126 | -73.1294 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5548.7132 | -55.7986 | 10.62 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5548.7132 | 136.7606 | 11.12 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5612.4819 | -225.989 | 11.79 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5612.4819 | 159.8126 | 11.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.886 | 202] 1.5 [DL + RSX] | 5799.1574 | -118.0621 | 86.0738 |
| Bottom | 0.907 | 202] 1.5 [DL + RSX] | 5862.926 | 122.277 | -165.5223 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4419.2851 | 129.8008 | -71.3681 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4483.0538 | 180.4709 | -72.3139 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5824.962 | -54.846 | 11.13 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5824.962 | 129.8008 | 11.59 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5888.7306 | -247.9858 | 12.44 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5888.7306 | 180.4709 | 12.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 202] 1.5 [DL + RSX] | 6062.6502 | -111.5057 | 73.8595 |
| Bottom | 0.937 | 202] 1.5 [DL + RSX] | 6126.4188 | 115.3371 | -193.6198 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4583.7148 | 135.3266 | -69.2615 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4647.4834 | 214.88 | -70.0602 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6095.2361 | -67.735 | 11.71 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6095.2361 | 135.3266 | 12.12 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6159.0048 | -275.8177 | 13.11 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6159.0048 | 214.88 | 12.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.942 | 202] 1.5 [DL + RSX] | 6320.5753 | -107.9711 | 90.3109 |
| Bottom | 0.985 | 202] 1.5 [DL + RSX] | 6386.3684 | 127.4036 | -221.3062 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4788.3749 | 90.3109 | -60.8857 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4854.1679 | 196.0847 | -60.9679 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6358.7207 | -97.3594 | 12.38 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6358.7207 | 165.4216 | 12.8 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6424.5138 | -296.6473 | 13.73 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6424.5138 | 271.4258 | 13.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.121 | 202] 1.5 [DL + RSX] | 6595.9792 | -241.0587 | 140.5831 |
| Bottom | 1.166 | 202] 1.5 [DL + RSX] | 6681.0041 | 243.5584 | 360.1348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4988.3105 | 140.5831 | -56.3098 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5073.3354 | 360.1348 | -56.3647 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6637.9277 | -149.4685 | 13.22 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6637.9277 | 217.4083 | 13.63 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6722.9526 | -361.8206 | 14.68 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6722.9526 | 398.981 | 14.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.122 | 202] 1.5 [DL + RSX] | 6830.513 | -210.3564 | 289.4545 |
| Bottom | 1.171 | 202] 1.5 [DL + RSX] | 6911.894 | 212.5483 | -562.9316 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5167.2376 | 289.4545 | -80.3602 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5248.6185 | 462.0745 | -80.3695 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6874.7367 | -278.5292 | 14.45 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6874.7367 | 334.5915 | 14.8 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6956.1177 | -580.5137 | 16.47 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6956.1177 | 479.6566 | 15.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.501 | 203] 1.5 [DL + RSY] | 840.0221 | 93.5739 | 69.418 |
| Bottom | 0.4 | 203] 1.5 [DL + RSY] | 977.3089 | -79.2764 | 33.2787 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 804.0391 | 150.1552 | -54.7971 | 105.5247 | 365.3508 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 846.5516 | 84.9521 | -55.1206 | 106.5433 | 366.3694 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 970.7793 | -24.494 | 3.04 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 970.7793 | 150.1552 | 4.78 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1013.2918 | -32.627 | 3.27 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1013.2918 | 84.9521 | 3.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.411 | 203] 1.5 [DL + RSY] | 1205.3195 | 71.1101 | -70.2127 |
| Bottom | 0.413 | 203] 1.5 [DL + RSY] | 1247.8319 | -72.6486 | 48.0975 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1046.4259 | 10.3519 | 70.0068 | 111.3325 | 371.1586 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1088.9384 | 99.0064 | 70.4055 | 112.3511 | 372.1772 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1212.9061 | -142.9218 | 5.35 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1212.9061 | 10.3519 | 3.51 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1255.4185 | -14.9393 | 3.69 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1255.4185 | 99.0064 | 4.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.459 | 203] 1.5 [DL + RSY] | 1474.148 | 75.3699 | -57.7256 |
| Bottom | 0.458 | 203] 1.5 [DL + RSY] | 1516.6604 | -74.4406 | 50.3571 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1285.499 | 33.5919 | 69.9831 | 114.4379 | 374.264 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1328.0114 | 107.3559 | 70.3523 | 115.4337 | 375.2598 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1474.148 | -46.8925 | 4.75 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1455.682 | 33.5919 | 4.51 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1498.1944 | -14.8816 | 4.37 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1516.6604 | 50.3571 | 4.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.497 | 203] 1.5 [DL + RSY] | 1742.4105 | 75.0544 | -52.1512 |
| Bottom | 0.503 | 203] 1.5 [DL + RSY] | 1784.923 | -74.8102 | 49.8341 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1522.5402 | 42.5478 | 69.3725 | 119.9904 | 379.8165 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1565.0526 | 109.6045 | 69.735 | 120.9862 | 380.8123 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1699.3885 | -137.4618 | 6.63 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1699.3885 | 42.5478 | 5.31 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1741.901 | -18.1908 | 5.09 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1741.901 | 109.6045 | 6.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.539 | 203] 1.5 [DL + RSY] | 2010.5647 | 75.7976 | -51.2427 |
| Bottom | 0.545 | 203] 1.5 [DL + RSY] | 2053.0772 | -75.6071 | 48.5878 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1758.0445 | 47.4026 | 69.9801 | 132.7271 | 392.5532 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1800.557 | 110.94 | 70.3359 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2010.5647 | -41.5856 | 6.16 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1944.4043 | 47.4026 | 6.06 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1986.9167 | -21.7594 | 5.82 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2053.0772 | 48.5878 | 6.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.587 | 203] 1.5 [DL + RSY] | 2279.1896 | 76.6303 | -50.785 |
| Bottom | 0.593 | 203] 1.5 [DL + RSY] | 2321.7021 | -76.5857 | 47.0442 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1992.5803 | 51.4253 | 70.8899 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2035.0928 | 112.5661 | 71.236 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2279.1896 | -40.8103 | 6.9 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2191.1078 | 51.4253 | 6.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2233.6202 | -25.589 | 6.56 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2321.7021 | 47.0442 | 7.1 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.619 | 203] 1.5 [DL + RSY] | 2548.8379 | 77.6964 | -49.92 |
| Bottom | 0.626 | 203] 1.5 [DL + RSY] | 2591.3504 | -77.8124 | 45.6231 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2226.6832 | 54.919 | 71.858 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2269.1956 | 114.8385 | 72.1899 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2548.8379 | -40.1754 | 7.64 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2439.8973 | 54.919 | 7.54 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2482.4097 | -29.951 | 7.31 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2591.3504 | 45.6231 | 7.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 203] 1.5 [DL + RSY] | 2820.064 | 78.9212 | -48.706 |
| Bottom | 0.679 | 203] 1.5 [DL + RSY] | 2862.5764 | -79.2216 | 44.2783 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2460.8869 | 57.7235 | 72.6977 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2503.3994 | 117.733 | 73.0124 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2820.064 | -39.4897 | 8.38 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2691.1968 | 57.7235 | 8.28 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2733.7092 | -35.3132 | 8.08 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2862.5764 | 44.2783 | 8.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.707 | 203] 1.5 [DL + RSY] | 3093.421 | 80.3507 | -47.7923 |
| Bottom | 0.714 | 203] 1.5 [DL + RSY] | 3135.9335 | -80.945 | 42.9714 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2695.7294 | 59.4751 | 73.4164 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2738.2418 | 121.378 | 73.7153 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3093.421 | -38.5615 | 9.13 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2945.4635 | 59.4751 | 9.01 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2987.976 | -42.0382 | 8.88 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3135.9335 | 42.9714 | 9.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.759 | 203] 1.5 [DL + RSY] | 3369.4347 | 81.7213 | -48.0922 |
| Bottom | 0.767 | 203] 1.5 [DL + RSY] | 3411.9471 | -82.1591 | 44.4855 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2931.7231 | 59.6519 | 74.6467 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2974.2356 | 128.0098 | 74.9326 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3369.4347 | -36.9245 | 9.87 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3203.1632 | 59.6519 | 9.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3245.6756 | -47.2396 | 9.67 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3411.9471 | 44.4855 | 10.1 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.815 | 203] 1.5 [DL + RSY] | 3648.8323 | 84.5046 | -46.379 |
| Bottom | 0.832 | 203] 1.5 [DL + RSY] | 3691.3448 | -86.5988 | 79.4245 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3169.5883 | 61.5389 | 87.8295 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3212.1007 | 175.7178 | 88.1088 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3648.8323 | -31.5264 | 10.57 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3465.0236 | 61.5389 | 10.48 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3507.5361 | -29.6205 | 10.15 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3691.3448 | 79.4245 | 11.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.851 | 203] 1.5 [DL + RSY] | 3931.7618 | 82.7109 | 5.9386 |
| Bottom | 0.891 | 203] 1.5 [DL + RSY] | 3974.2743 | -78.907 | -227.4846 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3409.317 | 89.1874 | -125.799 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3451.8294 | -71.1995 | -125.9764 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3931.7618 | -4.9822 | 10.99 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3931.7618 | 5.9386 | 11 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3773.6599 | -352.6571 | 15.38 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2328.562 | 13.5718 | 6.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.739 | 203] 1.5 [DL + RSY] | 4197.9869 | 86.4728 | 900.7802 |
| Bottom | 0.648 | 203] 1.5 [DL + RSY] | 4261.7555 | -81.915 | 76.8627 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3634.9277 | 920.4259 | -309.9182 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3698.6963 | 240.8529 | -309.9915 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4197.9869 | 900.7802 | 13.33 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4042.9158 | -122.3934 | 8.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4261.7555 | 76.8627 | 8.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.665 | 203] 1.5 [DL + RSY] | 4477.4561 | 79.1221 | 0.7691 |
| Bottom | 0.675 | 203] 1.5 [DL + RSY] | 4541.2248 | -81.4106 | 1.638 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3875.71 | 144.1475 | -77.8122 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3939.4787 | 180.2422 | -78.0039 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4238.5385 | -112.2558 | 8.54 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4477.4561 | 31.1226 | 8.48 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4541.2248 | -25.7468 | 8.57 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4541.2248 | 1.638 | 8.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.706 | 203] 1.5 [DL + RSY] | 4760.3553 | 78.5971 | -63.8707 |
| Bottom | 0.714 | 203] 1.5 [DL + RSY] | 4824.124 | -80.8343 | -4.6197 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4119.1269 | 84.6751 | 87.8532 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4182.8955 | 211.2351 | 88.0214 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4760.3553 | -37.5593 | 9.05 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4502.6121 | 84.6751 | 8.86 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4824.124 | -4.6197 | 8.96 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4824.124 | 19.6393 | 9.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.743 | 203] 1.5 [DL + RSY] | 5045.2136 | 77.7076 | -17.9647 |
| Bottom | 0.754 | 203] 1.5 [DL + RSY] | 5108.9823 | -80.5024 | 2.8692 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4364.5415 | 109.6935 | 83.7298 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4428.3101 | 231.0457 | 83.9123 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5045.2136 | -17.9647 | 9.45 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4769.8466 | 109.6935 | 9.51 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4833.6153 | -204.1098 | 10.21 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5108.9823 | 24.0667 | 9.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.784 | 203] 1.5 [DL + RSY] | 5332.2156 | 76.6406 | -10.7404 |
| Bottom | 0.794 | 203] 1.5 [DL + RSY] | 5395.9842 | -80.2289 | 3.0462 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4612.5784 | 121.2876 | 80.8749 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4676.3471 | 245.1883 | 81.1451 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5332.2156 | -10.7404 | 9.94 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5040.4474 | 121.2876 | 10.08 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5104.216 | -218.7815 | 10.8 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5395.9842 | 23.3607 | 10.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.824 | 203] 1.5 [DL + RSY] | 5621.3804 | 75.1145 | -7.8739 |
| Bottom | 0.835 | 203] 1.5 [DL + RSY] | 5685.149 | -79.7651 | 3.2729 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4863.7965 | 124.2851 | 79.8007 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4927.5652 | 259.6736 | 80.2153 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5621.3804 | -7.8739 | 10.46 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5314.5063 | 124.2851 | 10.61 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5378.275 | -233.59 | 11.4 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5685.149 | 22.8107 | 10.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.864 | 203] 1.5 [DL + RSY] | 5912.7769 | 73.1572 | -4.086 |
| Bottom | 0.876 | 203] 1.5 [DL + RSY] | 5976.5455 | -79.3351 | 4.9446 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5118.9157 | 123.3622 | 79.7532 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5182.6844 | 279.7428 | 80.3088 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5912.7769 | -4.086 | 10.97 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5592.2559 | 123.3622 | 11.12 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5656.0246 | -249.2279 | 12.01 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5976.5455 | 25.5703 | 11.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.904 | 203] 1.5 [DL + RSY] | 6205.6263 | 69.8478 | 2.5441 |
| Bottom | 0.916 | 203] 1.5 [DL + RSY] | 6269.395 | -77.2029 | 8.5313 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5378.0587 | 122.4079 | 74.9376 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5441.8273 | 294.2513 | 75.5585 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6205.6263 | -21.5841 | 11.63 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6205.6263 | 2.5441 | 11.51 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6269.395 | -12.8252 | 11.69 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6269.395 | 8.5313 | 11.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 203] 1.5 [DL + RSY] | 6503.4936 | 68.4733 | -7.9032 |
| Bottom | 0.96 | 203] 1.5 [DL + RSY] | 6569.2867 | -83.1518 | 10.1097 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5645.2672 | 117.8283 | 81.7531 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5711.0603 | 357.3477 | 82.3596 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6503.4936 | -7.9032 | 12.09 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6161.2327 | 117.8283 | 12.14 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6227.0258 | -300.8082 | 13.39 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6227.0258 | 357.3477 | 13.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.108 | 203] 1.5 [DL + RSY] | 6791.3877 | 224.3777 | -56.9005 |
| Bottom | 1.134 | 202] 1.5 [DL + RSX] | 6527.8036 | -212.5505 | 613.732 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5910.9894 | 138.441 | 112.3951 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5996.0143 | 613.732 | 112.8527 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6791.3877 | -25.1311 | 12.73 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6442.7787 | 138.441 | 12.79 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6527.8036 | -545.3852 | 15.46 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6876.4126 | 49.2115 | 13.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.117 | 203] 1.5 [DL + RSY] | 7032.7757 | 207.3639 | -50.3301 |
| Bottom | 1.184 | 202] 1.5 [DL + RSX] | 6761.3249 | -198.2954 | 987.7659 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6140.3873 | 423.9444 | 139.4638 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6221.7683 | 987.7659 | 139.5496 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7032.7757 | -26.12 | 13.18 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6679.944 | 423.9444 | 14.99 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7114.1566 | -32.2776 | 13.37 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7114.1566 | 40.3141 | 13.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.443 | 202] 1.5 [DL + RSX] | 1075.6471 | 71.0015 | -165.8623 |
| Bottom | 0.366 | 202] 1.5 [DL + RSX] | 1118.1596 | -67.2805 | -25.009 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 964.7033 | -105.9639 | 58.4071 | 113.0748 | 372.9009 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1007.2158 | 20.9624 | 58.3864 | 114.1279 | 373.954 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1165.5886 | -113.7236 | 4.82 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1208.101 | -40.1023 | 3.91 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1208.101 | 36.0556 | 3.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.405 | 202] 1.5 [DL + RSX] | 1255.4374 | 69.6385 | 57.6797 |
| Bottom | 0.401 | 202] 1.5 [DL + RSX] | 1297.9499 | -68.6443 | -39.7022 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1032.3552 | 79.9457 | -34.4982 | 114.7506 | 374.5767 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1074.8677 | 28.1913 | -34.912 | 115.8037 | 375.6298 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1342.6831 | -21.9237 | 4.03 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1342.6831 | 79.9457 | 4.84 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1385.1955 | -54.5979 | 4.61 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1385.1955 | 28.1913 | 4.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.434 | 202] 1.5 [DL + RSX] | 1439.9788 | 72.6933 | 44.9764 |
| Bottom | 0.434 | 202] 1.5 [DL + RSX] | 1482.4913 | -71.1597 | -42.0743 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1191.078 | 73.4804 | -33.0483 | 118.6825 | 378.5085 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1233.5904 | 28.9791 | -33.4488 | 119.7356 | 379.5616 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1522.8987 | -33.5926 | 4.7 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1522.8987 | 73.4804 | 5.25 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1565.4111 | -60.2412 | 5.19 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1565.4111 | 28.9791 | 4.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.467 | 202] 1.5 [DL + RSX] | 1628.0962 | 74.0496 | 44.4792 |
| Bottom | 0.471 | 202] 1.5 [DL + RSX] | 1670.6086 | -72.7075 | -43.2861 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1350.4447 | 73.2054 | -32.8023 | 122.6302 | 382.4563 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1392.9572 | 29.1743 | -33.2213 | 123.6833 | 383.5094 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1705.0738 | -35.125 | 5.22 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1705.0738 | 73.2054 | 5.75 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1747.5862 | -62.599 | 5.72 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1747.5862 | 29.1743 | 5.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.504 | 202] 1.5 [DL + RSX] | 1819.3081 | 75.6599 | 45.0073 |
| Bottom | 0.507 | 202] 1.5 [DL + RSX] | 1861.8205 | -74.1699 | -44.4714 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1510.2675 | 74.5313 | -33.4133 | 126.5893 | 386.4154 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1552.78 | 28.9914 | -33.8457 | 127.6424 | 387.4685 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1888.3878 | -35.2175 | 5.73 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1888.3878 | 74.5313 | 6.28 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1930.9003 | -64.4903 | 6.26 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1930.9003 | 28.9914 | 5.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 202] 1.5 [DL + RSX] | 2013.6016 | 77.1608 | 45.6493 |
| Bottom | 0.544 | 202] 1.5 [DL + RSX] | 2056.1141 | -75.5691 | -45.5623 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1670.5708 | 75.4553 | -34.1391 | 130.5602 | 390.3863 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1713.0833 | 28.5481 | -34.576 | 131.6133 | 391.4394 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2072.4309 | -34.4274 | 6.23 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2072.4309 | 75.4553 | 6.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2114.9433 | -66.3044 | 6.8 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2114.9433 | 28.5481 | 6.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.578 | 202] 1.5 [DL + RSX] | 2211.0296 | 78.5066 | 46.4406 |
| Bottom | 0.582 | 202] 1.5 [DL + RSX] | 2253.542 | -76.8838 | -46.4857 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1831.3198 | 75.782 | -34.9043 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1873.8323 | 28.1671 | -35.3234 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2256.8969 | -32.777 | 6.72 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2256.8969 | 75.782 | 7.32 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2299.4093 | -68.3527 | 7.34 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2299.4093 | 28.1671 | 6.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 202] 1.5 [DL + RSX] | 2411.6007 | 79.6142 | 47.2968 |
| Bottom | 0.62 | 202] 1.5 [DL + RSX] | 2454.1131 | -78.0643 | -47.2751 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1992.4452 | 75.6457 | -35.6796 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2034.9576 | 28.0605 | -36.057 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2441.5202 | -30.3503 | 7.2 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2441.5202 | 75.6457 | 7.83 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2484.0326 | -70.8881 | 7.88 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2484.0326 | 28.0605 | 7.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.653 | 202] 1.5 [DL + RSX] | 2615.235 | 80.3818 | 48.155 |
| Bottom | 0.657 | 202] 1.5 [DL + RSX] | 2657.7475 | -78.9101 | -47.3862 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2153.8485 | 75.2642 | -36.2079 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2196.3609 | 28.7496 | -36.53 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2626.0606 | -27.3656 | 7.67 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2626.0606 | 75.2642 | 8.34 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2668.573 | -73.2588 | 8.43 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2668.573 | 28.7496 | 7.81 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.692 | 202] 1.5 [DL + RSX] | 2821.8124 | 80.9878 | 49.7454 |
| Bottom | 0.699 | 202] 1.5 [DL + RSX] | 2864.3249 | -80.2913 | -47.4979 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2315.4465 | 75.5244 | -36.9561 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2357.959 | 28.6448 | -37.2245 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2810.3867 | -23.4135 | 8.13 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2821.8124 | 49.7454 | 8.53 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2864.3249 | -0.0772 | 7.96 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2852.8992 | 28.6448 | 8.32 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.694 | 202] 1.5 [DL + RSX] | 3030.7367 | 79.5854 | 51.8388 |
| Bottom | 0.704 | 202] 1.5 [DL + RSX] | 3073.2492 | -78.0603 | -83.3077 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2476.8227 | 75.7055 | -50.7753 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2519.3351 | -0.9451 | -50.988 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2994.1209 | -19.9232 | 8.59 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3030.7367 | 51.8388 | 9.14 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3073.2492 | -37.7573 | 9.06 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1925.4397 | 23.2679 | 5.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.733 | 202] 1.5 [DL + RSX] | 3240.2558 | 81.6239 | -33.2468 |
| Bottom | 0.784 | 202] 1.5 [DL + RSX] | 3282.7683 | -86.6238 | 205.3614 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2572.553 | 17.6038 | 74.7619 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2615.0654 | 205.3614 | 74.7483 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3240.2558 | -33.2468 | 9.46 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3240.2558 | 17.6038 | 9.25 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3282.7683 | 205.3614 | 11.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.786 | 202] 1.5 [DL + RSX] | 3491.8531 | 157.0367 | -746.8021 |
| Bottom | 0.645 | 202] 1.5 [DL + RSX] | 3555.6218 | -146.7495 | -66.3373 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2728.8972 | -521.3474 | 228.9415 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2792.6659 | -4.2245 | 228.9211 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3491.8531 | -746.8021 | 11.08 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3555.6218 | -4.2245 | 6.61 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3460.6688 | 100.2289 | 7.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.639 | 202] 1.5 [DL + RSX] | 3764.1351 | 126.6461 | 83.9581 |
| Bottom | 0.647 | 202] 1.5 [DL + RSX] | 3827.9037 | -131.0738 | -43.7484 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3022.0147 | 141.2311 | -49.0097 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3085.7834 | 135.0245 | -49.2678 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3764.1351 | -1.399 | 6.98 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3764.1351 | 83.9581 | 7.49 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3827.9037 | -43.7484 | 7.36 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3827.9037 | 26.0759 | 7.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.677 | 202] 1.5 [DL + RSX] | 4031.1918 | 130.6716 | 93.2162 |
| Bottom | 0.682 | 202] 1.5 [DL + RSX] | 4094.9605 | -130.7601 | -61.628 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3214.9465 | 171.7062 | -63.7445 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3278.7152 | 118.6436 | -64.3593 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3878.5667 | -42.8609 | 7.45 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4031.1918 | 93.2162 | 8.04 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4094.9605 | -61.628 | 7.96 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4094.9605 | 1.3496 | 7.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.703 | 202] 1.5 [DL + RSX] | 4295.7161 | 126.6056 | 67.6094 |
| Bottom | 0.711 | 202] 1.5 [DL + RSX] | 4359.4848 | -127.844 | -59.1796 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3404.7343 | 144.2047 | -55.1991 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3468.503 | 121.1855 | -56.0344 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4110.9287 | -64.5157 | 8.01 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4295.7161 | 67.6094 | 8.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4359.4848 | -2.2465 | 8.09 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4174.6974 | 121.1855 | 8.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 202] 1.5 [DL + RSX] | 4556.3479 | 122.6183 | 61.9867 |
| Bottom | 0.74 | 202] 1.5 [DL + RSX] | 4620.1166 | -124.4046 | -54.6244 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3590.6356 | 133.3824 | -52.5391 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3654.4043 | 131.4413 | -53.4828 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4337.2179 | -62.6779 | 8.42 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4556.3479 | 8.7178 | 8.49 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4620.1166 | -54.6244 | 8.89 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4620.1166 | 0.106 | 8.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.757 | 202] 1.5 [DL + RSX] | 4812.407 | 117.7823 | 59.806 |
| Bottom | 0.767 | 202] 1.5 [DL + RSX] | 4876.1757 | -120.4675 | -54.057 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3772.7162 | 129.1566 | -52.065 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3836.4848 | 146.4839 | -53.0326 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4556.9093 | -59.0504 | 8.8 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4812.407 | 59.806 | 9.28 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4876.1757 | -54.057 | 9.36 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4876.1757 | 2.8883 | 9.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.781 | 202] 1.5 [DL + RSX] | 5062.9546 | 111.3799 | 57.1005 |
| Bottom | 0.793 | 202] 1.5 [DL + RSX] | 5126.7233 | -114.319 | -64.1369 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3950.9043 | 132.2713 | -53.1361 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4014.673 | 163.6389 | -54.0288 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4769.3778 | -65.9396 | 9.24 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5062.9546 | 57.1005 | 9.73 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5126.7233 | -64.1369 | 9.89 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5126.7233 | 3.1958 | 9.51 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.805 | 202] 1.5 [DL + RSX] | 5307.178 | 105.94 | 52.1093 |
| Bottom | 0.827 | 202] 1.5 [DL + RSX] | 5370.9467 | -114.9134 | -83.1349 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4125.7295 | 144.197 | -52.207 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4189.4981 | 187.6741 | -52.946 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5307.178 | -2.9791 | 9.85 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5307.178 | 52.1093 | 10.15 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5370.9467 | -83.1349 | 10.46 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5370.9467 | 8.8624 | 10 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.815 | 202] 1.5 [DL + RSX] | 5540.7906 | 82.4785 | -25.1511 |
| Bottom | 0.843 | 202] 1.5 [DL + RSX] | 5606.5836 | 95.2117 | 137.4173 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4292.879 | 169.9939 | 50.501 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4358.6721 | 340.4359 | 51.0739 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5540.7906 | -25.1511 | 10.42 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5540.7906 | 54.0723 | 10.59 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5233.8634 | -201.7017 | 10.94 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5606.5836 | 137.4173 | 11.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.068 | 202] 1.5 [DL + RSX] | 6004.5451 | -252.9074 | -94.5947 |
| Bottom | 1.095 | 202] 1.5 [DL + RSX] | 6089.5699 | 255.4072 | 188.2537 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4705.2513 | 149.53 | 63.6736 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4790.2762 | 428.0489 | 64.0355 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6004.5451 | -94.5947 | 11.7 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6004.5451 | 6.8028 | 11.16 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6089.5699 | -30.9937 | 11.47 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6089.5699 | 188.2537 | 12.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.054 | 202] 1.5 [DL + RSX] | 6490.6441 | -204.951 | 119.1266 |
| Bottom | 1.083 | 202] 1.5 [DL + RSX] | 6572.0251 | 207.1429 | -253.2096 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5171.6704 | 314.585 | -78.8595 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5253.0514 | 483.0376 | -78.9188 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6490.6441 | -92.7145 | 12.59 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6490.6441 | 119.1266 | 12.76 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6208.1947 | -609.8253 | 15.26 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6208.1947 | 483.0376 | 14.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.461 | 202] 1.5 [DL + RSX] | 1073.6192 | -74.7406 | -172.2181 |
| Bottom | 0.38 | 202] 1.5 [DL + RSX] | 1116.1317 | 71.5854 | -25.4296 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 962.1313 | -109.0547 | 61.021 | 113.0111 | 372.8372 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1004.6437 | 22.7647 | 61.0136 | 114.0642 | 373.8903 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1144.9552 | -116.9362 | 4.8 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1187.4677 | -38.6367 | 3.84 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1187.4677 | 35.9718 | 3.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.415 | 202] 1.5 [DL + RSX] | 1252.4349 | -73.6658 | 51.6326 |
| Bottom | 0.412 | 202] 1.5 [DL + RSX] | 1294.9474 | 72.8592 | -37.1756 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1047.1924 | 72.3885 | -30.3022 | 115.1182 | 374.9443 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1089.7048 | 30.2741 | -30.7099 | 116.1713 | 375.9974 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1320.6556 | -26.3718 | 4.03 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1320.6556 | 72.3885 | 4.67 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1363.168 | -50.3207 | 4.49 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1363.168 | 30.2741 | 4.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.444 | 202] 1.5 [DL + RSX] | 1435.3143 | -76.5046 | 41.6827 |
| Bottom | 0.444 | 202] 1.5 [DL + RSX] | 1477.8268 | 75.1728 | -39.5167 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1204.2441 | 68.5115 | -29.6035 | 119.0086 | 378.8347 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1246.7566 | 31.0412 | -29.9997 | 120.0617 | 379.8878 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1499.1288 | -36.1983 | 4.67 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1499.1288 | 68.5115 | 5.12 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1541.6412 | -55.7407 | 5.06 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1541.6412 | 31.0412 | 4.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.473 | 202] 1.5 [DL + RSX] | 1621.2744 | -77.7479 | 41.1216 |
| Bottom | 0.478 | 202] 1.5 [DL + RSX] | 1663.7868 | 76.5774 | -40.6817 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1361.5123 | 68.3462 | -29.3395 | 122.9044 | 382.7305 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1404.0247 | 31.1826 | -29.7627 | 123.9575 | 383.7836 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1679.3274 | -37.8111 | 5.19 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1679.3274 | 68.3462 | 5.61 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1721.8399 | -57.8502 | 5.59 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1721.8399 | 31.1826 | 5.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.509 | 202] 1.5 [DL + RSX] | 1809.9399 | -79.2296 | 41.613 |
| Bottom | 0.514 | 202] 1.5 [DL + RSX] | 1852.4523 | 77.9055 | -41.8037 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1518.8295 | 69.5878 | -29.916 | 126.8014 | 386.6275 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1561.342 | 30.897 | -30.3573 | 127.8545 | 387.6806 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1860.4912 | -37.7698 | 5.69 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1860.4912 | 69.5878 | 6.13 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1903.0037 | -59.4651 | 6.11 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1903.0037 | 30.897 | 5.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.546 | 202] 1.5 [DL + RSX] | 2001.3542 | -80.5968 | 42.2543 |
| Bottom | 0.55 | 202] 1.5 [DL + RSX] | 2043.8666 | 79.1732 | -42.8915 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1676.2151 | 70.3873 | -30.644 | 130.7001 | 390.5261 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1718.7276 | 30.3616 | -31.0905 | 131.7532 | 391.5792 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2042.2401 | -36.7916 | 6.18 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2042.2401 | 70.3873 | 6.65 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2084.7526 | -61.1219 | 6.64 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2084.7526 | 30.3616 | 6.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.582 | 202] 1.5 [DL + RSX] | 2195.5965 | -81.7917 | 42.9953 |
| Bottom | 0.586 | 202] 1.5 [DL + RSX] | 2238.109 | 80.3478 | -43.8651 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1833.6254 | 70.5413 | -31.4151 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1876.1378 | 29.9713 | -31.8406 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2224.2715 | -34.9884 | 6.66 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2224.2715 | 70.5413 | 7.16 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2266.784 | -63.1784 | 7.17 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2266.784 | 29.9713 | 6.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.619 | 202] 1.5 [DL + RSX] | 2392.6785 | -82.7265 | 43.754 |
| Bottom | 0.623 | 202] 1.5 [DL + RSX] | 2435.191 | 81.3733 | -44.7419 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1990.9857 | 70.255 | -32.1917 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2033.4981 | 29.9564 | -32.5703 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2406.2937 | -32.5073 | 7.14 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2406.2937 | 70.255 | 7.66 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2448.8062 | -65.8795 | 7.72 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2448.8062 | 29.9564 | 7.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.655 | 202] 1.5 [DL + RSX] | 2592.5036 | -83.2904 | 44.4789 |
| Bottom | 0.659 | 202] 1.5 [DL + RSX] | 2635.016 | 82.0416 | -44.8994 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2148.1975 | 69.8081 | -32.6944 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2190.7099 | 30.8304 | -33.0129 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2592.5036 | -4.2874 | 7.26 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2592.5036 | 44.4789 | 7.82 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2635.016 | -44.8994 | 7.94 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2635.016 | 7.2811 | 7.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.691 | 202] 1.5 [DL + RSX] | 2794.9145 | -83.6508 | 45.9773 |
| Bottom | 0.699 | 202] 1.5 [DL + RSX] | 2837.427 | 83.215 | -45.095 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2305.176 | 70.1677 | -33.438 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2347.6884 | 30.8204 | -33.7002 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2794.9145 | -1.6857 | 7.79 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2794.9145 | 45.9773 | 8.4 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2837.427 | -45.095 | 8.51 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2837.427 | 4.2694 | 7.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.692 | 202] 1.5 [DL + RSX] | 2999.2577 | -81.9469 | 47.9442 |
| Bottom | 0.702 | 202] 1.5 [DL + RSX] | 3041.7701 | 80.7078 | -80.9472 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2461.5027 | 70.4976 | -47.0834 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2504.0152 | 1.2392 | -47.2912 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2999.2577 | -0.2408 | 8.33 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2999.2577 | 47.9442 | 9 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3041.7701 | -32.9363 | 8.91 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2991.8801 | 1.2392 | 8.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 202] 1.5 [DL + RSX] | 3203.7461 | -83.6756 | -36.9607 |
| Bottom | 0.783 | 202] 1.5 [DL + RSX] | 3246.2585 | 89.1996 | 204.8289 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2539.4416 | 13.7258 | 75.6148 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2581.9541 | 204.8289 | 75.6049 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3203.7461 | -36.9607 | 9.41 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3203.7461 | 13.7258 | 9.09 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3246.2585 | 204.8289 | 11.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.788 | 202] 1.5 [DL + RSX] | 3456.1955 | -160.0056 | -741.8726 |
| Bottom | 0.646 | 202] 1.5 [DL + RSX] | 3519.9641 | 149.8457 | -65.0892 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2697.8779 | -517.266 | 229.3828 | 204.3592 | 594.0984 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2761.6466 | 2.5617 | 229.3671 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3456.1955 | -517.266 | 9.59 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3519.9641 | -65.0892 | 6.92 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3519.9641 | 2.5617 | 6.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.64 | 202] 1.5 [DL + RSX] | 3729.0245 | -129.2664 | 84.0672 |
| Bottom | 0.647 | 202] 1.5 [DL + RSX] | 3792.7932 | 133.8779 | -44.1449 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3001.5444 | 143.0373 | -47.6362 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3065.3131 | 138.1739 | -47.912 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3729.0245 | -0.9846 | 6.91 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3729.0245 | 84.0672 | 7.42 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3792.7932 | -44.1449 | 7.3 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3792.7932 | 32.486 | 7.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.677 | 202] 1.5 [DL + RSX] | 3996.5124 | -133.1416 | 92.4754 |
| Bottom | 0.681 | 202] 1.5 [DL + RSX] | 4060.2811 | 133.3901 | -63.3865 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3194.4239 | 172.5066 | -62.5024 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3258.1925 | 120.0812 | -63.1416 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3837.1403 | -44.4848 | 7.38 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3996.5124 | 92.4754 | 7.97 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4060.2811 | -63.3865 | 7.91 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4060.2811 | 6.8319 | 7.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.701 | 202] 1.5 [DL + RSX] | 4261.3911 | -128.8826 | 65.5958 |
| Bottom | 0.71 | 202] 1.5 [DL + RSX] | 4325.1598 | 130.3028 | -61.4423 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3384.036 | 143.7931 | -53.9078 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3447.8047 | 121.8011 | -54.7691 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4071.6231 | -66.6928 | 7.95 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4261.3911 | 65.5958 | 8.3 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4325.1598 | -61.4423 | 8.39 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4325.1598 | 2.942 | 8.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.728 | 202] 1.5 [DL + RSX] | 4522.2919 | -124.6713 | 59.5879 |
| Bottom | 0.739 | 202] 1.5 [DL + RSX] | 4586.0606 | 126.6701 | -57.1474 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3569.5844 | 132.3944 | -51.3302 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3633.353 | 131.7196 | -52.2952 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4299.9282 | -64.631 | 8.36 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4522.2919 | 8.1755 | 8.43 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4586.0606 | -57.1474 | 8.85 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4586.0606 | 5.2764 | 8.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 202] 1.5 [DL + RSX] | 4778.5101 | -119.5709 | 57.4489 |
| Bottom | 0.766 | 202] 1.5 [DL + RSX] | 4842.2787 | 122.5025 | -56.9046 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3751.0746 | 127.9127 | -51.0575 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3814.8433 | 146.4638 | -52.0384 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4521.5254 | -60.5747 | 8.75 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4778.5101 | 57.4489 | 9.2 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4842.2787 | -56.9046 | 9.32 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4842.2787 | 7.746 | 9.01 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.778 | 202] 1.5 [DL + RSX] | 5029.0743 | -112.8692 | 54.8321 |
| Bottom | 0.791 | 202] 1.5 [DL + RSX] | 5092.8429 | 116.0963 | -67.4031 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3928.3769 | 130.7464 | -52.3531 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3992.1455 | 162.7644 | -53.2518 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4735.7697 | -67.358 | 9.19 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5029.0743 | 54.8321 | 9.65 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5092.8429 | -67.4031 | 9.85 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5092.8429 | 6.8406 | 9.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.801 | 202] 1.5 [DL + RSX] | 5273.1249 | -107.0708 | 49.6304 |
| Bottom | 0.825 | 202] 1.5 [DL + RSX] | 5336.8936 | 116.3487 | -85.3215 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4101.9601 | 141.8179 | -51.093 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4165.7288 | 186.2832 | -51.8334 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5273.1249 | -4.6521 | 9.79 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5273.1249 | 49.6304 | 10.07 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5336.8936 | -85.3215 | 10.41 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5336.8936 | 11.5508 | 9.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.811 | 202] 1.5 [DL + RSX] | 5506.3305 | -83.2881 | -26.6126 |
| Bottom | 0.838 | 202] 1.5 [DL + RSX] | 5572.1236 | -94.2274 | 143.0168 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4267.4281 | 167.022 | 52.3108 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4333.2212 | 343.1375 | 52.8813 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5506.3305 | -26.6126 | 10.36 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5506.3305 | 51.8425 | 10.52 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5203.2714 | -197.0684 | 10.85 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5572.1236 | 143.0168 | 11.2 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.031 | 202] 1.5 [DL + RSX] | 5968.4293 | 232.5166 | -93.4251 |
| Bottom | 1.058 | 202] 1.5 [DL + RSX] | 6053.4541 | -235.0164 | 184.4047 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4677.712 | 150.0738 | 62.2388 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4762.7369 | 422.5806 | 62.5961 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5968.4293 | -93.4251 | 11.63 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5968.4293 | 8.3689 | 11.1 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6053.4541 | -41.5431 | 11.47 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6053.4541 | 184.4047 | 12.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.075 | 202] 1.5 [DL + RSX] | 6459.9052 | 222.4369 | 128.8391 |
| Bottom | 1.108 | 202] 1.5 [DL + RSX] | 6541.2862 | 224.6288 | -263.5782 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5149.7028 | 326.1083 | -82.1133 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5231.0838 | 483.8214 | -82.1719 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6459.9052 | -86.405 | 12.5 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6459.9052 | 128.8391 | 12.76 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6182.7571 | -618.4707 | 15.27 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6182.7571 | 483.8214 | 14.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.5 | 203] 1.5 [DL + RSY] | 835.1671 | 94.5052 | -60.43 |
| Bottom | 0.41 | 203] 1.5 [DL + RSY] | 968.6021 | -80.3899 | -43.2945 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 796.1168 | 31.9561 | 48.6227 | 105.3349 | 365.161 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 838.6292 | 21.7516 | 48.9435 | 106.3535 | 366.1796 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 965.14 | -141.1103 | 4.64 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 965.14 | 31.9561 | 3.12 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1007.6524 | -94.7311 | 4.11 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1007.6524 | 21.7516 | 3.1 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.413 | 203] 1.5 [DL + RSY] | 1195.1748 | 71.7694 | 73.8269 |
| Bottom | 0.417 | 203] 1.5 [DL + RSY] | 1237.6872 | -73.4004 | -56.8875 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1036.9601 | 145.4385 | -73.1643 | 111.1057 | 370.9318 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1079.4725 | 6.1167 | -73.5625 | 112.1243 | 371.9504 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1207.2448 | -7.4353 | 3.46 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1207.2448 | 145.4385 | 5.37 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1249.7572 | -107.0084 | 4.96 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1249.7572 | 6.1167 | 3.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.462 | 203] 1.5 [DL + RSY] | 1462.3876 | 76.0575 | 63.7234 |
| Bottom | 0.462 | 203] 1.5 [DL + RSY] | 1504.9001 | -75.1167 | -58.852 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1274.2357 | 141.7433 | -73.2563 | 114.1741 | 374.0002 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1316.7481 | 6.9439 | -73.6245 | 115.1699 | 374.996 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1449.7422 | -29.4591 | 4.44 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1462.3876 | 63.7234 | 4.95 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1504.9001 | -48.983 | 4.86 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1492.2547 | 6.9439 | 4.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.497 | 203] 1.5 [DL + RSY] | 1728.963 | 75.7264 | 58.6944 |
| Bottom | 0.504 | 203] 1.5 [DL + RSY] | 1771.4755 | -75.4487 | -57.5125 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1509.3487 | 141.0509 | -72.5077 | 119.6814 | 379.5075 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1551.8611 | 10.6269 | -72.8694 | 120.6772 | 380.5033 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1693.0651 | -38.171 | 5.23 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1693.0651 | 141.0509 | 6.66 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1735.5776 | -116.6466 | 6.44 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1735.5776 | 10.6269 | 4.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.539 | 203] 1.5 [DL + RSY] | 1995.3768 | 76.4684 | 57.2506 |
| Bottom | 0.546 | 203] 1.5 [DL + RSY] | 2037.8892 | -76.242 | -55.6722 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1742.8183 | 143.7209 | -72.9831 | 132.3499 | 392.176 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1785.3307 | 14.3834 | -73.3383 | 133.403 | 393.2291 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1937.5983 | -43.149 | 5.98 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1995.3768 | 57.2506 | 6.34 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2037.8892 | -47.6737 | 6.32 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1980.1107 | 14.3834 | 5.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.587 | 203] 1.5 [DL + RSY] | 2262.231 | 77.2969 | 56.0227 |
| Bottom | 0.594 | 203] 1.5 [DL + RSY] | 2304.7435 | -77.232 | -53.9407 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1975.2372 | 146.2804 | -73.7564 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2017.7497 | 18.3337 | -74.1021 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2183.7447 | -47.45 | 6.72 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2262.231 | 56.0227 | 7.06 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2304.7435 | -46.9224 | 7.05 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2226.2571 | 18.3337 | 6.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 203] 1.5 [DL + RSY] | 2530.1012 | 78.3414 | 54.4214 |
| Bottom | 0.625 | 203] 1.5 [DL + RSY] | 2572.6137 | -78.4663 | -52.6191 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2207.161 | 147.9317 | -74.5746 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2249.6734 | 22.7815 | -74.9061 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2431.9267 | -51.3134 | 7.47 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2530.1012 | 54.4214 | 7.78 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2572.6137 | -45.9703 | 7.78 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2474.4391 | 22.7815 | 7.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.669 | 203] 1.5 [DL + RSY] | 2799.5617 | 79.5205 | 52.5194 |
| Bottom | 0.677 | 203] 1.5 [DL + RSY] | 2842.0741 | -79.864 | -51.2931 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2439.1416 | 148.3942 | -75.2529 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2481.654 | 28.1761 | -75.5673 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2682.5911 | -54.5751 | 8.21 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2799.5617 | 52.5194 | 8.51 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2842.0741 | -44.7522 | 8.52 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2725.1035 | 28.1761 | 7.96 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.704 | 203] 1.5 [DL + RSY] | 3071.1841 | 80.8841 | 50.9553 |
| Bottom | 0.713 | 203] 1.5 [DL + RSY] | 3113.6965 | -81.558 | -49.9995 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2671.7348 | 147.7416 | -75.8071 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2714.2473 | 34.791 | -76.1057 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2936.217 | -56.9129 | 8.95 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3071.1841 | 50.9553 | 9.24 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3113.6965 | -43.126 | 9.25 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2978.7294 | 34.791 | 8.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.756 | 203] 1.5 [DL + RSY] | 3345.511 | 82.1614 | 50.5974 |
| Bottom | 0.765 | 203] 1.5 [DL + RSY] | 3388.0235 | -82.6826 | -52.467 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2905.4722 | 145.819 | -76.817 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2947.9846 | 39.876 | -77.1027 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3193.291 | -57.9339 | 9.67 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3345.511 | 50.5974 | 10 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3388.0235 | -42.2571 | 10 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3235.8034 | 39.876 | 9.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.811 | 203] 1.5 [DL + RSY] | 3623.2999 | 84.9129 | 48.5336 |
| Bottom | 0.829 | 203] 1.5 [DL + RSY] | 3665.8124 | -87.2222 | -89.0456 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3141.0973 | 139.6999 | -89.7159 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3183.6097 | 22.6034 | -89.9952 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3454.5684 | -60.8455 | 10.44 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3623.2999 | 48.5336 | 10.74 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3665.8124 | -70.6026 | 11.16 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3497.0808 | 22.6034 | 10.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 203] 1.5 [DL + RSY] | 3904.6883 | 82.7291 | -8.952 |
| Bottom | 0.883 | 203] 1.5 [DL + RSY] | 3947.2007 | -78.8112 | 214.4723 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3378.6184 | 87.5779 | 123.4563 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3421.1308 | 344.3221 | 123.6336 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3904.6883 | -8.952 | 10.97 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3904.6883 | 7.3645 | 10.95 | 6 |
| Bottom–Left | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 2325.9058 | -19.2882 | 6.73 | 6 |
| Botttom–Right | Leg 1 | 450 | 206] [0.9 DL + 1.5 RSX] | 3762.6649 | 344.3221 | 15.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.734 | 203] 1.5 [DL + RSY] | 4169.5312 | 85.8866 | -893.4415 |
| Bottom | 0.645 | 203] 1.5 [DL + RSY] | 4233.2998 | -81.48 | -87.2595 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3602.5991 | -674.795 | 306.3603 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3666.3677 | 112.624 | 306.4365 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4169.5312 | -699.8197 | 12.04 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4233.2998 | -49.6017 | 8.15 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4031.5141 | 112.624 | 8.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 203] 1.5 [DL + RSY] | 4448.0007 | 78.8507 | -6.172 |
| Bottom | 0.67 | 203] 1.5 [DL + RSY] | 4511.7694 | -81.0796 | -5.8362 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3842.1234 | 110.2973 | 76.71 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3905.8921 | 196.8928 | 76.9018 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4448.0007 | -6.172 | 8.28 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4226.9163 | 110.2973 | 8.51 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4511.7694 | -5.8362 | 8.39 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4511.7694 | 15.2102 | 8.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.702 | 203] 1.5 [DL + RSY] | 4730.075 | 78.4617 | 62.9466 |
| Bottom | 0.71 | 203] 1.5 [DL + RSY] | 4793.8437 | -80.6382 | -4.1201 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4084.4506 | 185.0049 | -89.53 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4148.2192 | 189.7666 | -89.6972 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4490.8874 | -85.8824 | 8.85 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4730.075 | 62.9466 | 9.15 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4793.8437 | -4.1201 | 8.9 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4554.656 | 189.7666 | 9.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.739 | 203] 1.5 [DL + RSY] | 5014.2193 | 77.6417 | 15.2674 |
| Bottom | 0.75 | 203] 1.5 [DL + RSY] | 5077.988 | -80.4003 | -11.8808 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4328.9009 | 169.8167 | -85.5701 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4392.6696 | 197.1847 | -85.7517 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4758.0874 | -110.6627 | 9.49 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5014.2193 | 43.8866 | 9.56 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5077.988 | -11.8808 | 9.48 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4821.8561 | 197.1847 | 10.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.779 | 203] 1.5 [DL + RSY] | 5300.6088 | 76.6587 | 7.67 |
| Bottom | 0.79 | 203] 1.5 [DL + RSY] | 5364.3774 | -80.2211 | -12.8357 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4576.0811 | 163.1532 | -82.6112 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4639.8498 | 211.1199 | -82.8808 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5028.7183 | -123.3012 | 10.07 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5300.6088 | 32.182 | 10.01 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5364.3774 | -12.8357 | 10.01 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5092.4869 | 211.1199 | 10.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.819 | 203] 1.5 [DL + RSY] | 5589.2593 | 75.205 | 4.6492 |
| Bottom | 0.83 | 203] 1.5 [DL + RSY] | 5653.028 | -79.843 | -13.9326 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4826.5447 | 158.8979 | -81.3481 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4890.3133 | 225.2364 | -81.7626 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5302.8711 | -127.6338 | 10.61 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5589.2593 | 26.6149 | 10.51 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5653.028 | -13.9326 | 10.55 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5366.6398 | 225.2364 | 11.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.86 | 203] 1.5 [DL + RSY] | 5880.2388 | 73.3147 | -0.344 |
| Bottom | 0.871 | 203] 1.5 [DL + RSY] | 5944.0074 | -79.5002 | -16.6199 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5081.0129 | 149.4893 | -81.0978 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5144.7816 | 240.0657 | -81.654 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5880.2388 | -0.344 | 10.89 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5880.2388 | 21.6841 | 11.02 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5944.0074 | -16.6199 | 11.11 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5644.5466 | 240.0657 | 11.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.899 | 203] 1.5 [DL + RSY] | 6172.7727 | 70.056 | -9.5849 |
| Bottom | 0.911 | 203] 1.5 [DL + RSY] | 6236.5413 | -77.4232 | 0.8254 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5339.6182 | 135.4207 | -75.8681 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5403.3868 | 289.3564 | -76.4907 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6172.7727 | -9.5849 | 11.49 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6172.7727 | 16.1478 | 11.53 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6236.5413 | -15.0478 | 11.64 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6236.5413 | 0.8254 | 11.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.94 | 203] 1.5 [DL + RSY] | 6470.3775 | 68.7315 | -1.2256 |
| Bottom | 0.956 | 203] 1.5 [DL + RSY] | 6536.1706 | -83.4066 | -13.5062 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5606.3605 | 149.87 | -81.6272 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5672.1535 | 294.5796 | -82.2363 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6470.3775 | -1.2256 | 11.99 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6470.3775 | 25.9355 | 12.14 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6216.0314 | -363.9282 | 13.76 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6216.0314 | 294.5796 | 13.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.103 | 203] 1.5 [DL + RSY] | 6757.9327 | 223.9641 | 51.6585 |
| Bottom | 1.133 | 202] 1.5 [DL + RSX] | 6516.5273 | -212.4746 | -618.1456 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5871.7731 | 215.0692 | -112.0667 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5956.798 | 541.17 | -112.5233 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6431.5024 | -143.7979 | 12.8 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6757.9327 | 19.6128 | 12.64 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6842.9576 | -14.1059 | 12.76 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6516.5273 | 541.17 | 15.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.111 | 203] 1.5 [DL + RSY] | 6996.3259 | 206.2065 | 53.8512 |
| Bottom | 1.182 | 202] 1.5 [DL + RSX] | 6746.5582 | -197.2773 | -995.7028 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6097.4814 | 497.6547 | -140.7427 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6178.8624 | 971.7786 | -140.8284 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6665.1772 | -426.6901 | 14.98 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6996.3259 | 53.8512 | 13.29 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7077.7069 | -38.4969 | 13.34 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7077.7069 | 14.5728 | 13.2 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.473 | 202] 1.5 [DL + RSX] | 1447.3405 | 65.2381 | -208.1845 |
| Bottom | 0.404 | 202] 1.5 [DL + RSX] | 1489.8529 | -59.7042 | 27.2541 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1338.7817 | -159.6535 | 76.3424 | 122.3413 | 382.1674 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1381.2942 | 38.5077 | 76.2769 | 123.3944 | 383.2205 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1481.0783 | -159.6535 | 6.33 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1523.5908 | -33.8559 | 4.7 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1523.5908 | 38.5077 | 4.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.452 | 202] 1.5 [DL + RSX] | 1661.9026 | 58.8586 | 105.0437 |
| Bottom | 0.448 | 202] 1.5 [DL + RSX] | 1704.415 | -58.9907 | -57.0523 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1506.7142 | 116.7971 | -52.266 | 126.5013 | 386.3273 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1549.2266 | 11.9826 | -52.3878 | 127.5544 | 387.3804 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1054.6864 | -8.979 | 3.05 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1695.0365 | 116.7971 | 6.33 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1737.549 | -74.4157 | 5.86 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1737.549 | 11.9826 | 4.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.491 | 202] 1.5 [DL + RSX] | 1880.4956 | 61.8125 | 80.0626 |
| Bottom | 0.491 | 202] 1.5 [DL + RSX] | 1923.0081 | -60.6561 | -58.5036 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1676.3813 | 88.6887 | -43.2724 | 130.7042 | 390.5303 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1718.8938 | 12.1517 | -43.4521 | 131.7573 | 391.5834 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1910.0987 | -14.1201 | 5.5 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1910.0987 | 88.6887 | 6.54 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1952.6111 | -80.7747 | 6.55 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1952.6111 | 12.1517 | 5.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.535 | 202] 1.5 [DL + RSX] | 2101.0529 | 63.9372 | 80.832 |
| Bottom | 0.534 | 202] 1.5 [DL + RSX] | 2143.5653 | -62.5926 | -58.0252 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1847.4517 | 87.6483 | -42.2457 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1889.9641 | 14.0075 | -42.5016 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2125.8665 | -17.9413 | 6.15 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2125.8665 | 87.6483 | 7.12 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2168.379 | -81.9734 | 7.16 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2168.379 | 14.0075 | 6.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.58 | 202] 1.5 [DL + RSX] | 2322.9139 | 66.0235 | 83.3738 |
| Bottom | 0.577 | 202] 1.5 [DL + RSX] | 2365.4263 | -64.5859 | -59.3497 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2019.8054 | 88.649 | -42.1516 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2062.3178 | 14.2432 | -42.4878 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2342.1407 | -17.8833 | 6.75 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2342.1407 | 88.649 | 7.74 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2384.6532 | -82.1589 | 7.77 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2384.6532 | 14.2432 | 6.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.624 | 202] 1.5 [DL + RSX] | 2545.7134 | 68.0202 | 85.0692 |
| Bottom | 0.624 | 202] 1.5 [DL + RSX] | 2588.2258 | -66.5519 | -61.1883 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2193.2182 | 88.5272 | -42.0746 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2235.7307 | 14.2262 | -42.4546 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2558.7276 | -17.6505 | 7.35 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2558.7276 | 88.5272 | 8.34 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2601.2401 | -82.0599 | 8.37 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2601.2401 | 14.2262 | 7.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.635 | 202] 1.5 [DL + RSX] | 2769.1411 | 69.9344 | 86.194 |
| Bottom | 0.638 | 202] 1.5 [DL + RSX] | 2811.6536 | -68.4812 | -63.0137 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2367.4463 | 87.5702 | -42.0147 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2409.9587 | 14.6377 | -42.3865 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2775.4374 | -16.9433 | 7.94 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2775.4374 | 87.5702 | 8.93 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2817.9498 | -82.4039 | 8.97 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2817.9498 | 14.6377 | 8.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.679 | 202] 1.5 [DL + RSX] | 2992.9025 | 71.6972 | 86.288 |
| Bottom | 0.682 | 202] 1.5 [DL + RSX] | 3035.415 | -70.3209 | -65.2939 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2542.2592 | 85.9852 | -41.8243 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2584.7717 | 15.4656 | -42.1425 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2992.9025 | -16.3664 | 8.54 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2992.9025 | 86.288 | 9.51 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3035.415 | -2.6664 | 8.47 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3034.5791 | 15.4656 | 8.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.741 | 202] 1.5 [DL + RSX] | 3216.6876 | 73.2466 | 84.7553 |
| Bottom | 0.746 | 202] 1.5 [DL + RSX] | 3259.2001 | -72.1019 | -68.1107 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2717.4522 | 84.1723 | -41.114 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2759.9646 | 17.4207 | -41.353 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3216.6876 | -16.3312 | 9.16 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3216.6876 | 84.7553 | 10.11 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3259.2001 | -68.1107 | 10 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3259.2001 | 1.543 | 9.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.786 | 202] 1.5 [DL + RSX] | 3440.1402 | 74.3203 | 82.1132 |
| Bottom | 0.791 | 202] 1.5 [DL + RSX] | 3482.6526 | -73.1804 | -71.5225 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2876.7184 | 82.1132 | -41.0731 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2919.2309 | 9.0435 | -41.2129 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3440.1402 | -14.0668 | 9.75 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3440.1402 | 82.1132 | 10.7 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3482.6526 | -71.5225 | 10.67 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3482.6526 | 9.0435 | 9.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.809 | 202] 1.5 [DL + RSX] | 3663.1245 | 75.783 | 78.759 |
| Bottom | 0.821 | 202] 1.5 [DL + RSX] | 3705.6369 | -75.0199 | -119.1916 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3044.2778 | 78.759 | -54.7681 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3086.7903 | -21.8888 | -54.8971 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3663.1245 | -8.711 | 10.3 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3663.1245 | 78.759 | 11.27 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3705.6369 | -21.8888 | 10.6 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2347.1515 | 6.3273 | 6.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.845 | 202] 1.5 [DL + RSX] | 3885.9565 | 76.4441 | -45.1886 |
| Bottom | 0.898 | 202] 1.5 [DL + RSX] | 3928.469 | -81.6712 | 269.7358 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3211.8668 | 29.8925 | 91.6164 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3254.3792 | 269.7358 | 91.7289 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3885.9565 | -45.1886 | 11.42 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3885.9565 | 29.8925 | 11.21 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3928.469 | 269.7358 | 14.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.833 | 202] 1.5 [DL + RSX] | 4119.8062 | 136.9421 | -899.162 |
| Bottom | 0.7 | 202] 1.5 [DL + RSX] | 4183.5749 | -130.8508 | -121.0783 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3364.1072 | -704.5572 | 290.164 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3427.8759 | 86.6011 | 290.3026 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4119.8062 | -704.5572 | 11.98 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4183.5749 | -121.0783 | 8.49 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4183.5749 | 86.6011 | 8.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.731 | 202] 1.5 [DL + RSX] | 4402.8882 | 134.0549 | 131.3545 |
| Bottom | 0.736 | 202] 1.5 [DL + RSX] | 4466.6569 | -134.0823 | -109.1049 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3574.6587 | 174.3616 | -70.181 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3638.4274 | 141.8741 | -70.5733 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4402.8882 | -0.7124 | 8.16 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4402.8882 | 131.3545 | 8.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4466.6569 | -109.1049 | 8.95 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4466.6569 | 83.6646 | 8.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.761 | 202] 1.5 [DL + RSX] | 4684.62 | 128.881 | 140.468 |
| Bottom | 0.77 | 202] 1.5 [DL + RSX] | 4748.3886 | -130.9021 | -126.7824 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3742.9742 | 184.8959 | -80.6713 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3806.7428 | 124.6445 | -81.3314 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4684.62 | -4.162 | 8.7 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4684.62 | 140.468 | 9.54 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4748.3886 | -126.7824 | 9.58 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4748.3886 | 55.9497 | 9.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.793 | 202] 1.5 [DL + RSX] | 4963.361 | 127.0686 | 117.2466 |
| Bottom | 0.804 | 202] 1.5 [DL + RSX] | 5027.1297 | -128.8416 | -125.288 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3908.8934 | 157.3701 | -73.2825 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3972.662 | 132.8549 | -74.1441 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4963.361 | -30.0385 | 9.38 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4963.361 | 117.2466 | 9.92 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5027.1297 | -125.288 | 10.08 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5027.1297 | 57.1468 | 9.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.825 | 202] 1.5 [DL + RSX] | 5239.194 | 124.4663 | 112.1343 |
| Bottom | 0.837 | 202] 1.5 [DL + RSX] | 5302.9626 | -126.6511 | -130.8101 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4073.423 | 147.8271 | -73.0534 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4137.1917 | 143.569 | -74.032 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5239.194 | -27.1243 | 9.87 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5239.194 | 112.1343 | 10.39 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5302.9626 | -130.8101 | 10.63 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5302.9626 | 64.0386 | 10.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.855 | 202] 1.5 [DL + RSX] | 5511.7686 | 121.1334 | 101.7979 |
| Bottom | 0.87 | 202] 1.5 [DL + RSX] | 5575.5373 | -123.8839 | -145.1825 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4237.2214 | 136.3684 | -72.6421 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4300.9901 | 156.8711 | -73.6449 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5511.7686 | -20.4346 | 10.33 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5511.7686 | 101.7979 | 10.84 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5575.5373 | -145.1825 | 11.22 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5575.5373 | 76.3766 | 10.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.883 | 202] 1.5 [DL + RSX] | 5780.3693 | 117.0848 | 86.1108 |
| Bottom | 0.904 | 202] 1.5 [DL + RSX] | 5844.138 | -120.9945 | -168.5383 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4401.0219 | 127.5055 | -71.7918 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4464.7906 | 176.6462 | -72.7257 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5780.3693 | -12.3404 | 10.78 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5780.3693 | 86.1108 | 11.24 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5844.138 | -168.5383 | 11.86 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5844.138 | 97.1613 | 11.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.907 | 202] 1.5 [DL + RSX] | 6043.8834 | 110.86 | 74.134 |
| Bottom | 0.933 | 202] 1.5 [DL + RSX] | 6107.652 | -114.3443 | -196.4574 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4565.7737 | 131.3326 | -69.5053 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4629.5424 | 210.7006 | -70.2851 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6043.8834 | -9.3157 | 11.25 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6043.8834 | 74.134 | 11.65 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6107.652 | -196.4574 | 12.52 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6107.652 | 131.3741 | 12.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.939 | 202] 1.5 [DL + RSX] | 6301.839 | 107.6713 | 90.1475 |
| Bottom | 0.982 | 202] 1.5 [DL + RSX] | 6367.632 | -126.8132 | -221.5658 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4732.5914 | 160.3153 | -60.1574 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4798.3845 | 270.2094 | -60.7265 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6303.1533 | -95.8022 | 12.26 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6303.1533 | 160.3153 | 12.66 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6368.9464 | -295.3876 | 13.62 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6368.9464 | 270.2094 | 13.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.128 | 202] 1.5 [DL + RSX] | 6577.372 | 247.0803 | 141.4897 |
| Bottom | 1.173 | 202] 1.5 [DL + RSX] | 6662.3969 | 249.5801 | 364.2365 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4932.8825 | 141.4897 | -56.3253 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5017.9074 | 364.2365 | -56.381 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6581.2595 | -146.2989 | 13.09 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6581.2595 | 214.763 | 13.51 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6666.2844 | -366.0368 | 14.6 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6666.2844 | 406.999 | 14.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.122 | 202] 1.5 [DL + RSX] | 6809.8375 | 211.8078 | 291.1905 |
| Bottom | 1.172 | 202] 1.5 [DL + RSX] | 6891.2184 | 213.9997 | -570.8172 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5108.9563 | 291.1905 | -81.3402 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5190.3373 | 467.5188 | -81.3496 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6815.2832 | -284.3226 | 14.38 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6815.2832 | 338.279 | 14.71 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6896.6642 | -597.0145 | 16.46 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6896.6642 | 493.7161 | 15.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.666 | 202] 1.5 [DL + RSX] | 1140.6282 | -102.2806 | 271.0691 |
| Bottom | 0.489 | 202] 1.5 [DL + RSX] | 1347.1182 | 91.0236 | -72.7995 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1111.8708 | 310.4184 | -127.3512 | 116.7204 | 376.5465 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1154.3832 | 27.7865 | -127.6456 | 117.7735 | 377.5996 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1333.3632 | 310.4184 | 8.02 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1375.8756 | -100.3454 | 5.22 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1375.8756 | 27.7865 | 4.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.49 | 202] 1.5 [DL + RSX] | 1561.78 | -83.0592 | 64.3482 |
| Bottom | 0.497 | 202] 1.5 [DL + RSX] | 1604.2924 | 84.6666 | -55.4189 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1355.175 | 86.2925 | -48.9232 | 122.7474 | 382.5735 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1397.6875 | 43.207 | -49.2508 | 123.8005 | 383.6266 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1571.4441 | -57.6356 | 5.17 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1571.4441 | 86.2925 | 5.56 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1613.9565 | -86.2902 | 5.68 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1613.9565 | 43.207 | 5.08 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.548 | 202] 1.5 [DL + RSX] | 1818.7812 | -87.5315 | 87.6666 |
| Bottom | 0.54 | 202] 1.5 [DL + RSX] | 1861.2937 | 86.6121 | -57.98 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1594.6641 | 108.3872 | -57.2985 | 128.6799 | 388.506 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1637.1766 | 45.2594 | -57.6244 | 129.733 | 389.5591 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1818.7812 | -29.0594 | 5.46 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1818.7812 | 87.6666 | 6.27 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1850.7641 | -94.1349 | 6.45 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1861.2937 | 9.1045 | 5.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.588 | 202] 1.5 [DL + RSX] | 2076.944 | -87.7333 | 90.7219 |
| Bottom | 0.587 | 202] 1.5 [DL + RSX] | 2119.4565 | 87.2489 | -60.4681 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1832.4487 | 108.2502 | -57.4526 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1874.9611 | 47.6817 | -57.8246 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2076.944 | -35.9406 | 6.27 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2076.944 | 90.7219 | 7.03 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2119.4565 | -60.4681 | 6.73 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2119.4565 | 10.3638 | 6.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.624 | 202] 1.5 [DL + RSX] | 2336.033 | -88.9921 | 94.2326 |
| Bottom | 0.622 | 202] 1.5 [DL + RSX] | 2378.5455 | 88.4185 | -64.2553 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2068.8082 | 109.6638 | -57.9367 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2111.3206 | 49.4711 | -58.36 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2336.033 | -39.988 | 7.04 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2336.033 | 94.2326 | 7.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2378.5455 | -64.2553 | 7.5 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2378.5455 | 13.9667 | 6.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.672 | 202] 1.5 [DL + RSX] | 2596.0128 | -90.2128 | 97.3244 |
| Bottom | 0.671 | 202] 1.5 [DL + RSX] | 2638.5252 | 89.7092 | -68.4277 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2303.9803 | 111.1819 | -58.6057 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2346.4927 | 51.1376 | -59.0612 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2596.0128 | -43.1717 | 7.81 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2596.0128 | 97.3244 | 8.56 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2638.5252 | -68.4277 | 8.28 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2638.5252 | 18.2012 | 7.58 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.716 | 202] 1.5 [DL + RSX] | 2856.93 | -91.5873 | 99.796 |
| Bottom | 0.715 | 202] 1.5 [DL + RSX] | 2899.4425 | 91.1755 | -72.5513 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2538.2066 | 112.1578 | -59.2943 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2580.719 | 53.1366 | -59.7494 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2856.93 | -45.928 | 8.57 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2856.93 | 99.796 | 9.32 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2899.4425 | -72.5513 | 9.06 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2899.4425 | 22.5334 | 8.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.764 | 202] 1.5 [DL + RSX] | 3118.8964 | -93.0359 | 101.2711 |
| Bottom | 0.764 | 202] 1.5 [DL + RSX] | 3161.4089 | 92.7677 | -77.1049 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2771.7408 | 112.4336 | -59.8517 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2814.2533 | 55.3524 | -60.2733 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3118.8964 | -47.9706 | 9.33 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3118.8964 | 101.2711 | 10.07 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3161.4089 | -77.1049 | 9.85 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3161.4089 | 27.2443 | 9.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.791 | 202] 1.5 [DL + RSX] | 3382.0562 | -94.5403 | 101.0697 |
| Bottom | 0.795 | 202] 1.5 [DL + RSX] | 3424.5686 | 94.5383 | -82.6494 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3004.84 | 112.1624 | -60.0959 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3047.3525 | 57.6868 | -60.46 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3382.0562 | -48.8814 | 10.07 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3382.0562 | 101.0697 | 10.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3424.5686 | -82.6494 | 10.66 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3424.5686 | 33.241 | 9.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.84 | 202] 1.5 [DL + RSX] | 3646.5052 | -95.8747 | 98.6504 |
| Bottom | 0.847 | 202] 1.5 [DL + RSX] | 3689.0177 | 95.79 | -89.7756 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3237.6995 | 112.0184 | -60.3873 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3280.2119 | 61.0815 | -60.6844 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3646.5052 | -47.8637 | 10.79 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3646.5052 | 98.6504 | 11.5 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3689.0177 | -89.7756 | 11.49 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3689.0177 | 41.4221 | 10.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.893 | 202] 1.5 [DL + RSX] | 3912.6456 | -98.2531 | 93.3391 |
| Bottom | 0.903 | 202] 1.5 [DL + RSX] | 3955.1581 | 99.8501 | 90.264 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3470.8148 | 112.0685 | -46.1495 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3513.3272 | 102.9403 | -46.388 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3912.6456 | -43.2551 | 11.47 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3912.6456 | 93.3391 | 12.16 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3955.1581 | -54.3012 | 11.74 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3955.1581 | 90.264 | 12.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 202] 1.5 [DL + RSX] | 4182.4469 | -96.3523 | 135.4789 |
| Bottom | 0.994 | 202] 1.5 [DL + RSX] | 4224.9594 | 94.6624 | -358.5518 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3706.0655 | 164.3393 | -162.0123 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3748.5779 | -125.4357 | -162.1663 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3995.5532 | -18.7405 | 11.36 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4182.4469 | 135.4789 | 13.5 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4224.9594 | -358.5518 | 16.72 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.822 | 202] 1.5 [DL + RSX] | 4411.9381 | -99.1515 | 1090.8986 |
| Bottom | 0.702 | 202] 1.5 [DL + RSX] | 4475.7068 | 96.9721 | -202.3366 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3914.5947 | 1118.4495 | -423.7349 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3978.3633 | 138.3375 | -423.8979 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4411.9381 | 1090.8986 | 14.9 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4475.7068 | -202.3366 | 9.54 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4475.7068 | 74.7095 | 8.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.721 | 202] 1.5 [DL + RSX] | 4670.2227 | -95.3205 | 131.6314 |
| Bottom | 0.735 | 202] 1.5 [DL + RSX] | 4733.9914 | 96.5607 | -202.86 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4168.7406 | 182.2137 | -118.3674 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4232.5092 | 132.3022 | -118.8278 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4670.2227 | -58.786 | 9.01 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4670.2227 | 131.6314 | 9.46 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4733.9914 | -202.86 | 10.02 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4733.9914 | 58.4873 | 9.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.751 | 202] 1.5 [DL + RSX] | 4928.4773 | -92.988 | 121.9002 |
| Bottom | 0.765 | 202] 1.5 [DL + RSX] | 4992.2459 | 95.1492 | -166.7367 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4419.9641 | 170.4746 | -105.0886 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4483.7328 | 167.1009 | -105.723 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4928.4773 | -80.7412 | 9.63 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4928.4773 | 121.9002 | 9.88 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4992.2459 | -166.7367 | 10.27 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4992.2459 | 82.2183 | 9.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.784 | 202] 1.5 [DL + RSX] | 5185.8939 | -90.5307 | 147.6694 |
| Bottom | 0.796 | 202] 1.5 [DL + RSX] | 5249.6625 | 93.28 | -161.709 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4668.0073 | 188.2143 | -111.7271 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4731.776 | 181.8881 | -112.5066 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5185.8939 | -59.9083 | 9.97 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5185.8939 | 147.6694 | 10.52 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5249.6625 | -161.709 | 10.72 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5249.6625 | 88.325 | 10.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.815 | 202] 1.5 [DL + RSX] | 5442.6876 | -88.1896 | 145.3006 |
| Bottom | 0.829 | 202] 1.5 [DL + RSX] | 5506.4563 | 91.4794 | -167.8786 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4912.4886 | 175.6165 | -111.15 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4976.2573 | 194.439 | -112.0289 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5442.6876 | -55.1607 | 10.42 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5442.6876 | 145.3006 | 10.98 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5506.4563 | -167.8786 | 11.23 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5506.4563 | 96.4752 | 10.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.844 | 202] 1.5 [DL + RSX] | 5698.3714 | -85.3116 | 131.9613 |
| Bottom | 0.861 | 202] 1.5 [DL + RSX] | 5762.1401 | 89.4271 | -180.9715 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5151.1691 | 153.3262 | -108.1538 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5214.9377 | 209.6061 | -109.0604 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5698.3714 | -48.5281 | 10.85 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5698.3714 | 131.9613 | 11.37 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5762.1401 | -180.9715 | 11.79 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5762.1401 | 111.194 | 11.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.872 | 202] 1.5 [DL + RSX] | 5952.4017 | -81.8852 | -35.0453 |
| Bottom | 0.894 | 202] 1.5 [DL + RSX] | 6016.1704 | 86.901 | -201.9678 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5381.0337 | 128.6941 | -104.3112 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5444.8024 | 229.3214 | -105.1641 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5952.4017 | -35.0453 | 11.24 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5952.4017 | 110.3493 | 11.7 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6016.1704 | -201.9678 | 12.39 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6016.1704 | 133.484 | 11.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.907 | 202] 1.5 [DL + RSX] | 6204.3713 | -78.1142 | -14.2982 |
| Bottom | 0.927 | 202] 1.5 [DL + RSX] | 6268.1399 | 84.5682 | -231.9677 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5601.7297 | 111.3433 | -99.8779 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5665.4984 | 259.5421 | -100.5988 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6204.3713 | -14.2982 | 11.58 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6204.3713 | 79.9388 | 11.98 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6268.1399 | -231.9677 | 13.04 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6268.1399 | 166.821 | 12.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.94 | 202] 1.5 [DL + RSX] | 6453.4948 | -72.3578 | -3.6545 |
| Bottom | 0.961 | 202] 1.5 [DL + RSX] | 6519.2879 | 83.5685 | -251.8915 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5816.1862 | 124.308 | -84.3693 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5881.9793 | 313.3805 | -84.9098 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6453.4948 | -3.6545 | 11.97 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6453.4948 | 61.0062 | 12.33 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6519.2879 | -251.8915 | 13.63 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6519.2879 | 226.9957 | 13.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.123 | 202] 1.5 [DL + RSX] | 6699.9617 | -237.4544 | 121.8257 |
| Bottom | 1.176 | 202] 1.5 [DL + RSX] | 6784.9866 | 239.9542 | -388.5566 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5512.553 | 121.8257 | -80.1242 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5597.5779 | 346.1939 | -80.1792 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6699.9617 | -36.8562 | 12.63 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6699.9617 | 121.8257 | 13.16 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6784.9866 | -388.5566 | 14.96 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6784.9866 | 346.1939 | 14.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.139 | 202] 1.5 [DL + RSX] | 6992.6963 | -210.9146 | 280.0705 |
| Bottom | 1.188 | 202] 1.5 [DL + RSX] | 7074.0772 | 213.1065 | -545.8497 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5772.7459 | 280.0705 | -82.6679 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5854.1269 | 492.6225 | -82.6773 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6992.6963 | -207.3327 | 14.23 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6992.6963 | 280.0705 | 14.68 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7074.0772 | -545.8497 | 16.47 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7074.0772 | 492.6225 | 16.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.759 | 204] 1.2 [DL + LL + RSX] | 420.3575 | 270.2768 | 431.3538 |
| Bottom | 1.069 | 202] 1.5 [DL + RSX] | 490.8965 | -181.3166 | -288.0518 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 420.3575 | 431.3538 | -100.091 | 416.5643 | 1682.1339 |
| Bottom | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 650.1735 | 271.8049 | -100.0618 | 421.896 | 1687.4656 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 247.8616 | -73.9502 | 0.18 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 455.7456 | 479.813 | 0.54 | 6 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 685.5616 | -36.8243 | 0.41 | 6 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 685.5616 | 213.9142 | 0.52 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.093 | 202] 1.5 [DL + RSX] | 703.5907 | 175.0885 | 880.768 |
| Bottom | 2.62 | 202] 1.5 [DL + RSX] | 897.5144 | -382.3268 | 1023.3238 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 907.0637 | 1021.8339 | -83.4521 | 427.8559 | 1693.4255 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1062.2027 | 989.8291 | -92.7196 | 431.4551 | 1697.0247 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1003.3973 | 1026.0969 | 1.17 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1158.5362 | 1058.171 | 1.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.344 | 202] 1.5 [DL + RSX] | 1874.6265 | 450.3159 | 1261.143 |
| Bottom | 1.075 | 206] [0.9 DL + 1.5 RSX] | 1124.7156 | -227.3476 | 841.1299 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1889.9385 | 1755.2232 | -124.5221 | 450.6586 | 1716.2281 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 2060.4183 | 1531.6429 | -131.3175 | 454.6137 | 1720.1833 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1475.9042 | -339.8917 | 1.04 | 6 |
| Top–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 2324.2589 | 1261.143 | 2.06 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2525.3042 | -89.486 | 1.49 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2572.0603 | 1149.2311 | 2.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.533 | 206] [0.9 DL + 1.5 RSX] | 1257.4902 | 173.5299 | 871.43 |
| Bottom | 0.623 | 206] [0.9 DL + 1.5 RSX] | 1349.9529 | -200.4862 | 716.861 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2220.3405 | 2072.8635 | -188.0735 | 458.3239 | 1723.8935 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2443.8305 | 1845.646 | -195.4263 | 463.5089 | 1729.0784 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2800.1746 | -552.7931 | 1.92 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2800.1746 | 2072.8635 | 2.81 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3016.6372 | -630.1791 | 2.09 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3018.4213 | 959.9543 | 2.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.631 | 206] [0.9 DL + 1.5 RSX] | 1509.8467 | 216.6302 | 772.3626 |
| Bottom | 0.449 | 206] [0.9 DL + 1.5 RSX] | 1602.4531 | -209.7274 | 590.6022 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2613.2732 | 2234.2244 | -228.4435 | 467.4399 | 1733.0095 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2840.5689 | 2059.171 | -234.077 | 472.7132 | 1738.2828 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3344.9206 | -1102.3885 | 2.55 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3344.9206 | 2234.2244 | 3.22 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3565.5322 | -1106.779 | 2.68 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3565.5322 | 2059.171 | 3.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.442 | 206] [0.9 DL + 1.5 RSX] | 1762.6186 | 218.0129 | 687.8167 |
| Bottom | 0.355 | 206] [0.9 DL + 1.5 RSX] | 1853.4584 | -213.5613 | 509.8104 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3010.201 | 2409.7215 | 280.5495 | 476.6487 | 1742.2182 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3237.9462 | 2349.6749 | 284.6045 | 481.9324 | 1747.5019 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3901.0464 | -1517.7468 | 3.11 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3901.0464 | 2409.7215 | 3.64 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4122.3666 | -1525.2333 | 3.24 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4122.3666 | 2349.6749 | 3.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.354 | 206] [0.9 DL + 1.5 RSX] | 2013.1796 | 222.2888 | 622.1395 |
| Bottom | 0.351 | 202] 1.5 [DL + RSX] | 4554.2226 | -283.0935 | 648.5255 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3406.6542 | 2630.2752 | 338.5557 | 485.8464 | 1751.4159 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3634.6561 | 2724.1225 | 340.981 | 491.136 | 1756.7056 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4463.6772 | -1850.1872 | 3.63 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4463.6772 | 2630.2752 | 4.09 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4685.6939 | -1949.4184 | 3.81 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4685.6939 | 2724.1225 | 4.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.357 | 202] 1.5 [DL + RSX] | 4806.5934 | 279.4839 | 737.9409 |
| Bottom | 0.378 | 202] 1.5 [DL + RSX] | 5078.6149 | -300.816 | 668.0293 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3803.094 | 2922.4481 | 375.5556 | 495.0438 | 1760.6134 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4031.2174 | 3151.2768 | 376.7898 | 500.3362 | 1765.9058 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5032.4493 | -2176.3677 | 4.14 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5032.4493 | 2922.4481 | 4.58 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5254.9617 | -2381.0447 | 4.39 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5254.9617 | 3151.2768 | 4.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.378 | 203] 1.5 [DL + RSY] | 5622.8903 | 171.1765 | 3321.6781 |
| Bottom | 0.388 | 203] 1.5 [DL + RSY] | 5845.3333 | -177.5606 | 3304.793 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4206.7627 | 3321.6781 | -337.6493 | 504.4089 | 1769.9785 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4434.2133 | 3304.793 | -337.8684 | 509.6858 | 1775.2553 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5622.8903 | -2458.5325 | 4.65 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5622.8903 | 3321.6781 | 5.15 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5845.3333 | -2930.8997 | 5.05 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5845.3333 | 3304.793 | 5.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.39 | 203] 1.5 [DL + RSY] | 6225.1039 | 156.0972 | 3494.0085 |
| Bottom | 0.41 | 203] 1.5 [DL + RSY] | 6448.0604 | -172.8977 | 3560.5397 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4615.5708 | 3494.0085 | -292.501 | 513.8932 | 1779.4628 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4843.2844 | 3560.5397 | -292.5415 | 519.1762 | 1784.7458 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6225.1039 | -2966.5496 | 5.29 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6225.1039 | 3494.0085 | 5.6 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6448.0604 | -3260.6914 | 5.59 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6448.0604 | 3560.5397 | 5.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.415 | 203] 1.5 [DL + RSY] | 6828.9663 | 157.2486 | 3747.9214 |
| Bottom | 0.432 | 203] 1.5 [DL + RSY] | 7052.4964 | -172.1379 | 3733.3021 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5022.8057 | 3747.9214 | -291.6767 | 523.3411 | 1788.9107 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5250.7663 | 3733.3021 | -292.3023 | 528.6298 | 1794.1993 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6828.9663 | -3296.3489 | 5.82 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6828.9663 | 3747.9214 | 6.09 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7052.4964 | -3482.2207 | 6.06 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7052.4964 | 3733.3021 | 6.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.439 | 203] 1.5 [DL + RSY] | 7434.8045 | 155.5719 | 3925.626 |
| Bottom | 0.452 | 203] 1.5 [DL + RSY] | 7658.9179 | -169.8582 | 3810.895 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5428.9895 | 3925.626 | -302.8796 | 532.7646 | 1798.3341 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5657.2026 | 3810.895 | -304.4131 | 538.0591 | 1803.6287 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7434.8045 | -3519.3334 | 6.3 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7434.8045 | 3925.626 | 6.54 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7658.9179 | -3596.0898 | 6.47 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7658.9179 | 3810.895 | 6.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.462 | 203] 1.5 [DL + RSY] | 8041.848 | 153.2142 | 4006.25 |
| Bottom | 0.472 | 203] 1.5 [DL + RSY] | 8266.5368 | -166.1657 | 3803.5435 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5833.4368 | 4006.25 | -322.5166 | 542.1477 | 1807.7173 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6061.8868 | 3803.5435 | -324.827 | 547.4478 | 1813.0173 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8041.848 | -3635.3777 | 6.71 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8041.848 | 4006.25 | 6.93 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8266.5368 | -3619.1013 | 6.83 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8266.5368 | 3803.5435 | 6.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.482 | 203] 1.5 [DL + RSY] | 8649.6404 | 150.075 | 3996.6258 |
| Bottom | 0.491 | 203] 1.5 [DL + RSY] | 8874.8907 | -161.5501 | 3740.3484 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6235.6708 | 3996.6258 | -346.6703 | 551.4796 | 1817.0491 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6464.3431 | 3740.3484 | -349.3577 | 556.7848 | 1822.3543 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8649.6404 | -3656.6536 | 7.07 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8649.6404 | 3996.6258 | 7.27 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8874.8907 | -3578.6788 | 7.16 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8874.8907 | 3740.3484 | 7.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.501 | 203] 1.5 [DL + RSY] | 9257.755 | 146.0541 | 3921.8052 |
| Bottom | 0.509 | 203] 1.5 [DL + RSY] | 9483.5414 | -156.494 | 3662.5889 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6635.2116 | 3921.8052 | -371.7528 | 560.7489 | 1826.3185 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6864.0921 | 3662.5889 | -374.359 | 566.0589 | 1831.6285 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9257.755 | -3606.4468 | 7.39 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9257.755 | 3921.8052 | 7.58 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9483.5414 | -3514.4299 | 7.47 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9483.5414 | 3662.5889 | 7.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.519 | 203] 1.5 [DL + RSY] | 9865.7375 | 141.3386 | 3819.1323 |
| Bottom | 0.528 | 203] 1.5 [DL + RSY] | 10092.0222 | -151.4809 | 3614.8619 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7031.6252 | 3819.1323 | -394.8608 | 569.9457 | 1835.5153 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7260.7034 | 3614.8619 | -397.0237 | 575.2603 | 1840.8299 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9865.7375 | -3520.3227 | 7.69 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9865.7375 | 3819.1323 | 7.86 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10092.0222 | -3472.9194 | 7.79 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10092.0222 | 3614.8619 | 7.87 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.537 | 203] 1.5 [DL + RSY] | 10473.0599 | 136.3295 | 3730.7216 |
| Bottom | 0.549 | 203] 1.5 [DL + RSY] | 10699.7938 | -147.1159 | 3631.6789 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7424.5651 | 3730.7216 | -414.4019 | 579.0619 | 1844.6315 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7653.8334 | 3631.6789 | -415.935 | 584.3809 | 1849.9505 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10473.0599 | -3442.2744 | 7.99 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10473.0599 | 3730.7216 | 8.16 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10699.7938 | -3496.6837 | 8.15 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10699.7938 | 3631.6789 | 8.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.558 | 203] 1.5 [DL + RSY] | 11079.1119 | 131.3711 | 3691.9882 |
| Bottom | 0.572 | 203] 1.5 [DL + RSY] | 11306.2346 | -143.8291 | 3719.625 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7813.8104 | 3691.9882 | -430.9507 | 588.0924 | 1853.662 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8043.2596 | 3719.625 | -431.8767 | 593.4156 | 1858.9852 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11079.1119 | -3415.6729 | 8.32 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11079.1119 | 3691.9882 | 8.48 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11306.2346 | -3614.1875 | 8.56 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11306.2346 | 3719.625 | 8.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.582 | 203] 1.5 [DL + RSY] | 11683.0178 | 126.4588 | 3714.3821 |
| Bottom | 0.597 | 203] 1.5 [DL + RSY] | 11910.4703 | -137.7902 | 3868.4545 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8199.1315 | 3714.3821 | -436.0507 | 597.0319 | 1862.6014 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8428.7625 | 3868.4545 | -436.632 | 602.3593 | 1867.9289 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11683.0178 | -3474.381 | 8.7 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11683.0178 | 3714.3821 | 8.84 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11910.4703 | -3799.7337 | 9.02 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11910.4703 | 3868.4545 | 9.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.608 | 203] 1.5 [DL + RSY] | 12283.4125 | 125.962 | 3795.4291 |
| Bottom | 0.624 | 203] 1.5 [DL + RSY] | 12511.1105 | -135.9191 | 4045.3455 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8580.1161 | 3795.4291 | 414.7344 | 605.8707 | 1871.4403 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8809.9092 | 4045.3455 | 415.541 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12283.4125 | -3600.6186 | 9.11 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12283.4125 | 3795.4291 | 9.23 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12511.1105 | -3918.5132 | 9.43 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12511.1105 | 4045.3455 | 9.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.635 | 203] 1.5 [DL + RSY] | 12883.0158 | 127.3137 | 3915.4853 |
| Bottom | 0.652 | 203] 1.5 [DL + RSY] | 13110.8939 | -143.1246 | 4083.0604 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8961.0062 | 3915.4853 | 346.0276 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9190.878 | 4083.0604 | 347.6153 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12883.0158 | -3667.4165 | 9.49 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12883.0158 | 3915.4853 | 9.64 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13110.8939 | -3887.9733 | 9.75 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13110.8939 | 4083.0604 | 9.87 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.652 | 203] 1.5 [DL + RSY] | 13479.4619 | 104.3511 | 3938.5132 |
| Bottom | 0.674 | 203] 1.5 [DL + RSY] | 13707.7735 | -132.7211 | 4118.2698 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9340.9799 | 3938.5132 | -346.7226 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9571.1899 | 4118.2698 | -348.9223 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13479.4619 | -3606.5506 | 9.8 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13479.4619 | 3938.5132 | 9.99 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13707.7735 | -3891.7896 | 10.1 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13707.7735 | 4118.2698 | 10.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 203] 1.5 [DL + RSY] | 14074.9565 | 107.8189 | 3947.6823 |
| Bottom | 0.69 | 203] 1.5 [DL + RSY] | 14303.7091 | -128.2581 | 4124.2578 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9722.3798 | 3947.6823 | -386.0777 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9952.851 | 4124.2578 | -389.1766 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 14074.9565 | -3573.4122 | 10.12 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 14074.9565 | 3947.6823 | 10.34 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14303.7091 | -3944.72 | 10.47 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14303.7091 | 4124.2578 | 10.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.696 | 203] 1.5 [DL + RSY] | 14669.161 | 108.7027 | 3913.4648 |
| Bottom | 0.714 | 203] 1.5 [DL + RSY] | 14898.3738 | -124.7816 | 4194.1837 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10106.2515 | 3913.4648 | -421.2994 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10336.9587 | 4194.1837 | -425.2048 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14669.161 | -3572.5479 | 10.46 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14669.161 | 3913.4648 | 10.66 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14898.3738 | -4023.8898 | 10.85 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14898.3738 | 4194.1837 | 10.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.72 | 203] 1.5 [DL + RSY] | 15260.7309 | 106.6943 | 3926.5128 |
| Bottom | 0.74 | 203] 1.5 [DL + RSY] | 15490.41 | -120.3253 | 4424.9331 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10492.9182 | 3926.5128 | -467.7238 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10723.8293 | 4424.9331 | -472.0075 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15260.7309 | -3582.5593 | 10.8 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15260.7309 | 3926.5128 | 11 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15490.41 | -4219.7847 | 11.3 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15490.41 | 4424.9331 | 11.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.745 | 203] 1.5 [DL + RSY] | 15848.1873 | 103.0366 | 4095.4571 |
| Bottom | 0.769 | 203] 1.5 [DL + RSY] | 16078.3431 | -114.6077 | 4935.0213 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10883.2864 | 4095.4571 | 522.9241 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11114.378 | 4935.0213 | 527.0343 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15848.1873 | -3704.7425 | 11.21 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15848.1873 | 4095.4571 | 11.44 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16078.3431 | -4648.269 | 11.89 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16078.3431 | 4935.0213 | 12.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.759 | 203] 1.5 [DL + RSY] | 16429.6963 | 97.8753 | 4563.468 |
| Bottom | 0.786 | 203] 1.5 [DL + RSY] | 16660.3372 | -107.3438 | 5822.9439 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11278.7456 | 4563.468 | 595.0172 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11509.996 | 5822.9439 | 598.6054 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16429.6963 | -4079.1338 | 11.76 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16429.6963 | 4563.468 | 12.04 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16660.3372 | -5395.8111 | 12.66 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16660.3372 | 5822.9439 | 12.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.79 | 203] 1.5 [DL + RSY] | 17002.93 | 91.3106 | 5450.5136 |
| Bottom | 0.82 | 203] 1.5 [DL + RSY] | 17234.0663 | -95.6415 | 7124.6616 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11681.2358 | 5450.5136 | 667.6172 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11912.6257 | 7124.6616 | 670.404 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17002.93 | -4813.0845 | 12.51 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17002.93 | 5450.5136 | 12.89 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17234.0663 | -6522.1606 | 13.65 | 6 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17234.0663 | 7124.6616 | 14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.826 | 203] 1.5 [DL + RSY] | 17564.7096 | 85.8517 | 6795.4232 |
| Bottom | 0.864 | 203] 1.5 [DL + RSY] | 17802.8543 | -85.9097 | 8868.3592 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12093.0967 | 6795.4232 | -751.0894 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12331.09 | 8868.3592 | -753.017 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17564.7096 | -5970.1766 | 13.51 | 6 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17564.7096 | 6795.4232 | 14 | 6 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17802.8543 | -8235.5053 | 14.97 | 6 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17802.8543 | 8868.3592 | 15.34 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.079 | 203] 1.5 [DL + RSY] | 18227.4996 | 508.0641 | 8230.2574 |
| Bottom | 1.189 | 203] 1.5 [DL + RSY] | 18528.7762 | -516.9216 | 11772.5364 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12660.5279 | 8230.2574 | 900.5335 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12961.3212 | 11772.5364 | 901.7173 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18227.4996 | -7978.4762 | 15.07 | 6 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18227.4996 | 8230.2574 | 15.21 | 6 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18528.7762 | -11283.392 | 17.17 | 6 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18528.7762 | 11772.5364 | 17.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.226 | 203] 1.5 [DL + RSY] | 18959.3827 | 563.7172 | -11512.5882 |
| Bottom | 1.336 | 203] 1.5 [DL + RSY] | 19249.4314 | -571.5294 | -15089.2178 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13335.2797 | 11047.9029 | -896.7145 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13624.8865 | 14078.1544 | -896.8425 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18959.3827 | -11512.5882 | 17.55 | 6 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18959.3827 | 11047.9029 | 17.28 | 6 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19249.4314 | -15089.2178 | 19.81 | 6 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19249.4314 | 14078.1544 | 19.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.757 | 204] 1.2 [DL + LL + RSX] | 467.9082 | -260.5921 | 516.5083 |
| Bottom | 0.847 | 206] [0.9 DL + 1.5 RSX] | 313.751 | -132.0211 | 283.3805 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 467.9082 | 516.5083 | -83.1689 | 417.6675 | 1683.237 |
| Bottom | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 697.7242 | 417.7282 | -83.2273 | 422.9992 | 1688.5688 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 323.3165 | -43.5898 | 0.21 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 527.1784 | 606.5814 | 0.66 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 610.5865 | -118.6353 | 0.42 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 756.9944 | 417.9427 | 0.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.514 | 206] [0.9 DL + 1.5 RSX] | 370.9939 | -83.6624 | 521.9026 |
| Bottom | 1.191 | 206] [0.9 DL + 1.5 RSX] | 487.3481 | 172.7707 | 601.0144 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 856.6219 | 965.2357 | -115.8892 | 426.6856 | 1692.2552 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1011.7608 | 824.9059 | -125.236 | 430.2849 | 1695.8544 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 531.0831 | -17.906 | 0.31 | 6 |
| Top–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 984.6932 | 893.2592 | 1.08 | 6 |
| Bottom–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 652.5222 | -100.1487 | 0.43 | 6 |
| Botttom–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 1139.8322 | 820.5478 | 1.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 206] [0.9 DL + 1.5 RSX] | 621.7495 | 163.3649 | -321.026 |
| Bottom | 0.868 | 206] [0.9 DL + 1.5 RSX] | 717.1135 | 166.7789 | 522.2885 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1199.9056 | 397.2222 | 87.5293 | 434.6498 | 1700.2194 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1383.2328 | 578.5379 | 87.2584 | 438.903 | 1704.4726 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1690.8749 | -301.9769 | 1.14 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1690.8749 | 397.2222 | 1.2 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1947.3636 | -297.291 | 1.28 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1947.3636 | 578.5379 | 1.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.652 | 206] [0.9 DL + 1.5 RSX] | 856.317 | -156.63 | 564.0282 |
| Bottom | 0.638 | 206] [0.9 DL + 1.5 RSX] | 960.231 | 168.4365 | 482.2368 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1686.1957 | 1270.003 | -116.3888 | 445.9317 | 1711.5013 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1880.9782 | 1159.7392 | -120.8843 | 450.4507 | 1716.0203 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2169.6322 | -138.9903 | 1.32 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2169.6322 | 670.2877 | 1.63 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2447.7607 | -196.6186 | 1.51 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2447.7607 | 553.6414 | 1.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.617 | 206] [0.9 DL + 1.5 RSX] | 1123.6591 | -180.7328 | 558.8217 |
| Bottom | 0.455 | 206] [0.9 DL + 1.5 RSX] | 1226.7944 | 174.9159 | 446.9093 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2079.2165 | 1770.989 | 194.5828 | 455.0498 | 1720.6194 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2317.1636 | 1754.6911 | 199.8449 | 460.5702 | 1726.1398 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2718.775 | -1269.4032 | 2.29 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2718.775 | 1770.989 | 2.59 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2997.7954 | -87.3168 | 1.76 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2997.7954 | 536.8075 | 2.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.426 | 206] [0.9 DL + 1.5 RSX] | 1387.6193 | -184.2082 | 571.2909 |
| Bottom | 0.331 | 207] [0.9 DL + 1.5 RSY] | 1485.3824 | 115.4424 | 2070.6492 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2507.6233 | 2182.5556 | 268.1178 | 464.9889 | 1730.5584 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2745.1099 | 2175.4721 | 271.804 | 470.4986 | 1736.0681 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3309.4269 | -1593.6444 | 2.82 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3309.4269 | 2182.5556 | 3.17 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3553.528 | -1651.3576 | 2.99 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3553.528 | 2175.4721 | 3.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.326 | 206] [0.9 DL + 1.5 RSX] | 1646.5728 | -187.627 | 561.084 |
| Bottom | 0.317 | 207] [0.9 DL + 1.5 RSY] | 1707.017 | 111.8133 | 2498.7323 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2932.6189 | 2531.8136 | 318.0359 | 474.8488 | 1740.4183 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3169.844 | 2613.9861 | 320.1771 | 480.3524 | 1745.9219 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3900.8814 | -1872.3749 | 3.32 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3900.8814 | 2531.8136 | 3.71 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4144.2908 | -2037.7172 | 3.56 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4144.2908 | 2613.9861 | 3.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.309 | 202] 1.5 [DL + RSX] | 4377.8211 | -231.8292 | 699.2365 |
| Bottom | 0.333 | 202] 1.5 [DL + RSX] | 4664.8722 | 259.057 | 586.468 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3355.0618 | 2887.153 | 344.1832 | 484.6494 | 1750.219 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3592.1703 | 3059.2667 | 345.163 | 490.1504 | 1755.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4493.4204 | -2175.4054 | 3.84 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4493.4204 | 2887.153 | 4.25 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4736.3293 | -2466.4304 | 4.14 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4736.3293 | 3059.2667 | 4.49 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.342 | 203] 1.5 [DL + RSY] | 5103.9852 | -141.7903 | 3306.3669 |
| Bottom | 0.355 | 203] 1.5 [DL + RSY] | 5346.9438 | 151.8559 | 3251.8887 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3780.782 | 3306.3669 | -329.3552 | 494.5261 | 1760.0957 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4018.583 | 3251.8887 | -329.4341 | 500.0431 | 1765.6127 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5103.9852 | -2470.1528 | 4.36 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5103.9852 | 3306.3669 | 4.85 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5346.9438 | -2995.2891 | 4.8 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5346.9438 | 3251.8887 | 4.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.358 | 203] 1.5 [DL + RSY] | 5724.7811 | -129.9957 | 3511.162 |
| Bottom | 0.378 | 203] 1.5 [DL + RSY] | 5967.2148 | 149.2989 | 3512.4152 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4208.1418 | 3511.162 | -289.2061 | 504.4409 | 1770.0105 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4445.6913 | 3512.4152 | -289.1019 | 509.952 | 1775.5216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5724.7811 | -2958.5502 | 5 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5724.7811 | 3511.162 | 5.32 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5967.2148 | -3329.2118 | 5.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5967.2148 | 3512.4152 | 5.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.383 | 203] 1.5 [DL + RSY] | 6344.3855 | -130.5124 | 3763.5169 |
| Bottom | 0.401 | 203] 1.5 [DL + RSY] | 6586.2366 | 149.4814 | 3693.1771 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4632.5421 | 3763.5169 | -284.4832 | 514.287 | 1779.8565 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4869.8534 | 3693.1771 | -285.0456 | 519.7926 | 1785.3622 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6344.3855 | -3293.2776 | 5.55 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6344.3855 | 3763.5169 | 5.82 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6586.2366 | -3544.2552 | 5.83 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6586.2366 | 3693.1771 | 5.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.408 | 203] 1.5 [DL + RSY] | 6963.3799 | -128.9123 | 3942.9861 |
| Bottom | 0.423 | 203] 1.5 [DL + RSY] | 7204.6406 | 148.2832 | 3775.6545 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5054.461 | 3942.9861 | -294.7607 | 524.0755 | 1789.6451 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5291.5269 | 3775.6545 | -296.3129 | 529.5754 | 1795.145 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6963.3799 | -3510.4866 | 6.03 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6963.3799 | 3942.9861 | 6.28 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7204.6406 | -3648.7932 | 6.24 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7204.6406 | 3775.6545 | 6.32 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.431 | 203] 1.5 [DL + RSY] | 7581.2202 | -126.9869 | 4022.9628 |
| Bottom | 0.445 | 203] 1.5 [DL + RSY] | 7821.9004 | 145.8998 | 3769.5098 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5473.5036 | 4022.9628 | -314.7815 | 533.7973 | 1799.3668 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5710.3378 | 3769.5098 | -317.1485 | 539.2918 | 1804.8614 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7581.2202 | -3617.6911 | 6.44 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7581.2202 | 4022.9628 | 6.68 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7821.9004 | -3663.1313 | 6.61 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7821.9004 | 3769.5098 | 6.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.452 | 203] 1.5 [DL + RSY] | 8197.5911 | -124.3781 | 4009.9645 |
| Bottom | 0.464 | 203] 1.5 [DL + RSY] | 8437.7064 | 142.8881 | 3705.6653 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5889.4386 | 4009.9645 | -339.512 | 543.447 | 1809.0165 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6126.0538 | 3705.6653 | -342.2433 | 548.9364 | 1814.506 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8197.5911 | -3630.9956 | 6.8 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8197.5911 | 4009.9645 | 7.02 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8437.7064 | -3616.8885 | 6.93 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8437.7064 | 3705.6653 | 6.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.472 | 203] 1.5 [DL + RSY] | 8812.1415 | -120.8678 | 3931.1569 |
| Bottom | 0.484 | 203] 1.5 [DL + RSY] | 9051.7185 | 139.6303 | 3627.6143 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6302.0261 | 3931.1569 | -364.6718 | 553.019 | 1818.5886 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6538.4353 | 3627.6143 | -367.2789 | 558.5037 | 1824.0733 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8812.1415 | -3576.3642 | 7.12 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8812.1415 | 3931.1569 | 7.33 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9051.7185 | -3551.2415 | 7.24 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9051.7185 | 3627.6143 | 7.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.49 | 203] 1.5 [DL + RSY] | 9424.4694 | -116.6854 | 3826.5272 |
| Bottom | 0.504 | 203] 1.5 [DL + RSY] | 9663.5457 | 136.298 | 3581.0447 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6711.06 | 3826.5272 | -387.1303 | 562.5086 | 1828.0782 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6947.2739 | 3581.0447 | -389.2443 | 567.9888 | 1833.5583 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9424.4694 | -3491.4868 | 7.42 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9424.4694 | 3826.5272 | 7.61 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9663.5457 | -3513.3018 | 7.57 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9663.5457 | 3581.0447 | 7.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.508 | 203] 1.5 [DL + RSY] | 10034.0932 | -112.3861 | 3739.752 |
| Bottom | 0.525 | 203] 1.5 [DL + RSY] | 10272.7169 | 132.9455 | 3599.2939 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7116.3967 | 3739.752 | -405.4147 | 571.9124 | 1837.482 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7352.424 | 3599.2939 | -406.8593 | 577.3882 | 1842.9578 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10034.0932 | -3421.4784 | 7.73 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10034.0932 | 3739.752 | 7.91 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10272.7169 | -3544.4025 | 7.93 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10272.7169 | 3599.2939 | 7.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.531 | 203] 1.5 [DL + RSY] | 10640.4523 | -108.6521 | 3705.333 |
| Bottom | 0.549 | 203] 1.5 [DL + RSY] | 10878.6826 | 129.1714 | 3686.6647 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7517.985 | 3705.333 | -420.0618 | 581.2293 | 1846.7988 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7753.836 | 3686.6647 | -420.8791 | 586.701 | 1852.2706 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10640.4523 | -3408.8365 | 8.06 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10640.4523 | 3705.333 | 8.24 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10878.6826 | -3669.1179 | 8.35 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10878.6826 | 3686.6647 | 8.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.556 | 203] 1.5 [DL + RSY] | 11242.7901 | -106.2639 | 3732.11 |
| Bottom | 0.573 | 203] 1.5 [DL + RSY] | 11480.6849 | 120.9032 | 3831.6499 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7915.7717 | 3732.11 | -422.3877 | 590.4579 | 1856.0275 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8151.4465 | 3831.6499 | -422.8624 | 595.9256 | 1861.4951 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11242.7901 | -3483.2136 | 8.45 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11242.7901 | 3732.11 | 8.6 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11480.6849 | -3856.6643 | 8.81 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11480.6849 | 3831.6499 | 8.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.583 | 203] 1.5 [DL + RSY] | 11839.9461 | -109.1365 | 3815.4763 |
| Bottom | 0.598 | 203] 1.5 [DL + RSY] | 12077.5899 | 114.9148 | 4010.0163 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8309.5618 | 3815.4763 | -386.3526 | 599.5938 | 1865.1634 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8545.0801 | 4010.0163 | -387.0868 | 605.0579 | 1870.6274 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11839.9461 | -3620.71 | 8.87 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11839.9461 | 3815.4763 | 8.99 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12077.5899 | -3966.3032 | 9.21 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12077.5899 | 4010.0163 | 9.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.611 | 203] 1.5 [DL + RSY] | 12435.0182 | -112.1865 | 3941.4455 |
| Bottom | 0.627 | 203] 1.5 [DL + RSY] | 12672.477 | 123.0352 | 4073.226 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8702.3065 | 3941.4455 | 321.8262 | 608.7055 | 1874.2751 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8937.751 | 4073.226 | 323.4335 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12435.0182 | -3688.5636 | 9.25 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12435.0182 | 3941.4455 | 9.4 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12672.477 | -3914.9316 | 9.52 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12672.477 | 4073.226 | 9.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.629 | 203] 1.5 [DL + RSY] | 13025.5003 | -90.2733 | 3988.115 |
| Bottom | 0.65 | 203] 1.5 [DL + RSY] | 13262.5225 | 116.823 | 4104.6729 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9093.9542 | 3988.115 | -328.2222 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9329.0634 | 4104.6729 | -330.4492 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13025.5003 | -3613.1127 | 9.54 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13025.5003 | 3988.115 | 9.76 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13262.5225 | -3907.5062 | 9.85 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13262.5225 | 4104.6729 | 9.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.646 | 203] 1.5 [DL + RSY] | 13612.4306 | -90.5962 | 3993.8883 |
| Bottom | 0.666 | 203] 1.5 [DL + RSY] | 13849.0103 | 114.7523 | 4100.4368 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9486.0132 | 3993.8883 | -368.1123 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9720.8628 | 4100.4368 | -371.2865 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13612.4306 | -3576.9685 | 9.86 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13612.4306 | 3993.8883 | 10.1 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13849.0103 | -3950.8128 | 10.21 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13849.0103 | 4100.4368 | 10.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.67 | 203] 1.5 [DL + RSY] | 14195.3887 | -89.2587 | 3951.7496 |
| Bottom | 0.69 | 203] 1.5 [DL + RSY] | 14431.5079 | 113.0332 | 4159.5567 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9879.381 | 3951.7496 | -403.5994 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10113.9951 | 4159.5567 | -407.5959 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 14195.3887 | -3576.8872 | 10.19 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14195.3887 | 3951.7496 | 10.41 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14431.5079 | -4021.7447 | 10.58 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14431.5079 | 4159.5567 | 10.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.693 | 203] 1.5 [DL + RSY] | 14773.1983 | -86.1907 | 3958.6433 |
| Bottom | 0.716 | 203] 1.5 [DL + RSY] | 15008.8518 | 110.0721 | 4382.9464 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10274.3693 | 3958.6433 | -449.488 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10508.7787 | 4382.9464 | -453.8539 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14773.1983 | -3591.401 | 10.53 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14773.1983 | 3958.6433 | 10.74 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15008.8518 | -4209.0371 | 11.02 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15008.8518 | 4382.9464 | 11.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.717 | 203] 1.5 [DL + RSY] | 15344.5874 | -82.2079 | 4126.2473 |
| Bottom | 0.744 | 203] 1.5 [DL + RSY] | 15579.7656 | 105.7469 | 4890.9617 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10671.7562 | 4126.2473 | -503.1704 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10905.9838 | 4890.9617 | -507.4058 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15344.5874 | -3719.1568 | 10.93 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15344.5874 | 4126.2473 | 11.17 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15579.7656 | -4630.2226 | 11.6 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15579.7656 | 4890.9617 | 11.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 203] 1.5 [DL + RSY] | 15907.9957 | -77.1769 | 4596.6032 |
| Bottom | 0.762 | 203] 1.5 [DL + RSY] | 16142.6902 | 99.5548 | 5783.5104 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11072.6767 | 4596.6032 | 571.8788 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11306.7441 | 5783.5104 | 575.6352 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15907.9957 | -4098.9034 | 11.47 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15907.9957 | 4596.6032 | 11.76 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16142.6902 | -5374.6818 | 12.35 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16142.6902 | 5783.5104 | 12.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.76 | 203] 1.5 [DL + RSY] | 16461.4863 | -71.491 | 5487.7332 |
| Bottom | 0.795 | 203] 1.5 [DL + RSY] | 16695.6866 | 88.5871 | 7098.9004 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11478.682 | 5487.7332 | 648.8157 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11712.6086 | 7098.9004 | 651.7549 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16461.4863 | -4837.7802 | 12.22 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16461.4863 | 5487.7332 | 12.6 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16695.6866 | -6504.8686 | 13.33 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16695.6866 | 7098.9004 | 13.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.798 | 203] 1.5 [DL + RSY] | 17002.3343 | -65.9452 | 6840.1612 |
| Bottom | 0.842 | 203] 1.5 [DL + RSY] | 17242.6749 | 64.6373 | 8863.4032 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11891.48 | 6840.1612 | -736.9659 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12131.9492 | 8863.4032 | -738.9856 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17002.3343 | -6000.297 | 13.21 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17002.3343 | 6840.1612 | 13.7 | 6 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17242.6749 | -8224.7723 | 14.65 | 6 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17242.6749 | 8863.4032 | 15.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.097 | 203] 1.5 [DL + RSY] | 17648.3406 | -559.7055 | 8269.8614 |
| Bottom | 1.21 | 203] 1.5 [DL + RSY] | 17950.4514 | 568.5876 | 11810.8934 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12459.8126 | 8269.8614 | 901.177 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12762.3796 | 11810.8934 | 902.4987 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17648.3406 | -8025.1671 | 14.76 | 6 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17648.3406 | 8269.8614 | 14.91 | 6 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17950.4514 | -11280.0496 | 16.84 | 6 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17950.4514 | 11810.8934 | 17.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.143 | 203] 1.5 [DL + RSY] | 18408.7207 | -461.3826 | -11584.6331 |
| Bottom | 1.252 | 203] 1.5 [DL + RSY] | 18698.3881 | 469.1845 | -15129.5213 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13160.418 | 11017.9051 | -888.9759 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13450.5123 | 14071.3263 | -889.2888 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18408.7207 | -11584.6331 | 17.28 | 6 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18408.7207 | 11017.9051 | 16.95 | 6 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 18698.3881 | -15129.5213 | 19.52 | 6 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 18698.3881 | 14071.3263 | 18.9 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.63 | 202] 1.5 [DL + RSX] | 1162.0179 | 96.1075 | 281.0083 |
| Bottom | 0.476 | 202] 1.5 [DL + RSX] | 1371.0998 | -85.2389 | -77.8739 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1131.3579 | 320.3196 | -131.6915 | 117.2031 | 377.0292 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1173.8704 | 23.2258 | -131.9722 | 118.2562 | 378.0823 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1359.2474 | 320.3196 | 8.22 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1401.7598 | -104.4915 | 5.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1401.7598 | 23.2258 | 4.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.477 | 202] 1.5 [DL + RSX] | 1578.9107 | 78.4584 | 60.8786 |
| Bottom | 0.485 | 202] 1.5 [DL + RSX] | 1621.4232 | -79.7742 | -57.1528 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1368.8541 | 83.207 | -47.9432 | 123.0862 | 382.9123 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1411.3665 | 41.9474 | -48.2675 | 124.1393 | 383.9654 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1590.9112 | -62.635 | 5.29 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1590.9112 | 83.207 | 5.57 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1633.4236 | -87.2338 | 5.75 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1633.4236 | 41.9474 | 5.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.536 | 202] 1.5 [DL + RSX] | 1829.7924 | 82.9709 | 86.7375 |
| Bottom | 0.531 | 202] 1.5 [DL + RSX] | 1872.3049 | -81.9624 | -59.0676 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1603.0287 | 108.2587 | -57.0012 | 128.8871 | 388.7132 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1645.5412 | 44.7684 | -57.336 | 129.9402 | 389.7663 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1829.7924 | -31.3504 | 5.52 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1829.7924 | 86.7375 | 6.29 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1872.3049 | -59.0676 | 6.02 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1872.3049 | 9.5499 | 5.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.579 | 202] 1.5 [DL + RSX] | 2082.366 | 83.4961 | 90.3914 |
| Bottom | 0.578 | 202] 1.5 [DL + RSX] | 2124.8785 | -82.8999 | -61.3594 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1835.8675 | 108.965 | -57.4087 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1878.3799 | 47.3664 | -57.7993 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2082.366 | -37.5814 | 6.31 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2082.366 | 90.3914 | 7.04 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2124.8785 | -61.3594 | 6.75 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2124.8785 | 11.092 | 6.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 202] 1.5 [DL + RSX] | 2336.3479 | 85.0251 | 94.1694 |
| Bottom | 0.613 | 202] 1.5 [DL + RSX] | 2378.8603 | -84.338 | -65.1218 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2067.6143 | 110.6358 | -58.1348 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2110.1267 | 49.2943 | -58.5779 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2336.3479 | -41.3397 | 7.06 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2336.3479 | 94.1694 | 7.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2378.8603 | -65.1218 | 7.51 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2378.8603 | 14.755 | 6.81 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.663 | 202] 1.5 [DL + RSX] | 2591.6507 | 86.5171 | 97.3991 |
| Bottom | 0.662 | 202] 1.5 [DL + RSX] | 2634.1632 | -85.8879 | -69.3675 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2298.4652 | 111.9894 | -59.0094 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2340.9776 | 51.2393 | -59.4751 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2591.6507 | -44.3505 | 7.82 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2591.6507 | 97.3991 | 8.55 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2634.1632 | -69.3675 | 8.28 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2634.1632 | 18.9475 | 7.58 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.707 | 202] 1.5 [DL + RSX] | 2848.2842 | 88.1596 | 99.9298 |
| Bottom | 0.706 | 202] 1.5 [DL + RSX] | 2890.7966 | -87.6072 | -73.6423 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2528.6261 | 112.5239 | -59.8266 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2571.1385 | 53.6357 | -60.2748 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2848.2842 | -47.0062 | 8.56 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2848.2842 | 99.9298 | 9.3 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2890.7966 | -73.6423 | 9.05 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2890.7966 | 23.1711 | 8.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.755 | 202] 1.5 [DL + RSX] | 3106.3302 | 89.8767 | 101.3824 |
| Bottom | 0.755 | 202] 1.5 [DL + RSX] | 3148.8426 | -89.4483 | -78.411 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2758.3189 | 112.2457 | -60.4117 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2800.8313 | 56.2292 | -60.8085 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3106.3302 | -49.0295 | 9.31 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3106.3302 | 101.3824 | 10.04 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3148.8426 | -78.411 | 9.84 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3148.8426 | 27.7207 | 9.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.782 | 202] 1.5 [DL + RSX] | 3365.9096 | 91.6568 | 101.0581 |
| Bottom | 0.788 | 202] 1.5 [DL + RSX] | 3408.422 | -91.4705 | -84.2673 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2987.7729 | 111.4626 | -60.6036 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3030.2854 | 58.7171 | -60.9314 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3365.9096 | -50.0183 | 10.04 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3365.9096 | 101.0581 | 10.75 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3408.422 | -84.2673 | 10.64 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3408.422 | 33.4632 | 9.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.833 | 202] 1.5 [DL + RSX] | 3627.099 | 93.2758 | 98.3312 |
| Bottom | 0.839 | 202] 1.5 [DL + RSX] | 3669.6115 | -92.9603 | -91.6511 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3217.1583 | 110.879 | -60.736 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3259.6708 | 62.0851 | -60.9963 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3627.099 | -49.249 | 10.76 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3627.099 | 98.3312 | 11.44 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3669.6115 | -91.6511 | 11.47 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3669.6115 | 41.4267 | 10.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.885 | 202] 1.5 [DL + RSX] | 3890.3045 | 95.9975 | 92.5995 |
| Bottom | 0.895 | 202] 1.5 [DL + RSX] | 3932.817 | -97.4113 | 88.76 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3446.9573 | 110.6476 | -46.6588 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3489.4697 | 102.7009 | -46.8699 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3890.3045 | -44.9483 | 11.43 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3890.3045 | 92.5995 | 12.09 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3932.817 | -57.2801 | 11.72 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3932.817 | 88.76 | 12.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.936 | 202] 1.5 [DL + RSX] | 4157.4597 | 94.1913 | 133.0979 |
| Bottom | 0.984 | 202] 1.5 [DL + RSX] | 4199.9721 | -91.8558 | -358.9591 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3679.0435 | 161.4492 | -160.7801 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3721.5559 | -122.6908 | -160.9224 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3973.4996 | -21.7182 | 11.34 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4157.4597 | 133.0979 | 13.4 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4199.9721 | -358.9591 | 16.65 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.814 | 202] 1.5 [DL + RSX] | 4384.2286 | 96.9495 | 1082.7222 |
| Bottom | 0.695 | 202] 1.5 [DL + RSX] | 4447.9973 | -94.4442 | -202.1622 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3885.8135 | 1108.8723 | -419.93 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3949.5822 | 142.5208 | -420.0926 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4384.2286 | 1082.7222 | 14.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4447.9973 | -202.1622 | 9.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4447.9973 | 78.9135 | 8.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.714 | 202] 1.5 [DL + RSX] | 4639.25 | 93.1398 | 129.9498 |
| Bottom | 0.729 | 202] 1.5 [DL + RSX] | 4703.0187 | -94.2179 | -201.1381 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4138.7297 | 181.9759 | -116.0841 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4202.4984 | 136.8717 | -116.5713 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4639.25 | -59.9976 | 8.96 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4639.25 | 129.9498 | 9.39 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4703.0187 | -201.1381 | 9.95 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4703.0187 | 64.2306 | 9.11 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.744 | 202] 1.5 [DL + RSX] | 4894.563 | 91.0346 | 122.4528 |
| Bottom | 0.758 | 202] 1.5 [DL + RSX] | 4958.3317 | -93.0264 | -165.9773 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4388.8931 | 172.9754 | -103.9148 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4452.6618 | 169.2965 | -104.5872 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4894.563 | -79.8507 | 9.56 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4894.563 | 122.4528 | 9.82 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4958.3317 | -165.9773 | 10.21 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4958.3317 | 86.8046 | 9.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.777 | 202] 1.5 [DL + RSX] | 5149.3054 | 88.7766 | 147.7722 |
| Bottom | 0.79 | 202] 1.5 [DL + RSX] | 5213.0741 | -91.3433 | -162.0571 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4636.0649 | 190.1406 | -110.9375 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4699.8336 | 182.0444 | -111.7515 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5149.3054 | -59.2762 | 9.9 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5149.3054 | 147.7722 | 10.45 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5213.0741 | -162.0571 | 10.65 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5213.0741 | 91.7758 | 10.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.808 | 202] 1.5 [DL + RSX] | 5403.672 | 86.6615 | 144.6628 |
| Bottom | 0.822 | 202] 1.5 [DL + RSX] | 5467.4407 | -89.7367 | -169.1833 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4879.8745 | 176.3804 | -110.6081 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4943.6432 | 193.1948 | -111.5095 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5403.672 | -54.9639 | 10.35 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5403.672 | 144.6628 | 10.9 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5467.4407 | -169.1833 | 11.17 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5467.4407 | 98.9578 | 10.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.837 | 202] 1.5 [DL + RSX] | 5657.1789 | 84.0185 | 130.6059 |
| Bottom | 0.854 | 202] 1.5 [DL + RSX] | 5720.9476 | -87.8944 | -183.0307 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5117.9231 | 152.7812 | -107.7636 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5181.6917 | 207.3612 | -108.6779 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5657.1789 | -48.8174 | 10.78 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5657.1789 | 130.6059 | 11.28 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5720.9476 | -183.0307 | 11.72 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5720.9476 | 112.7699 | 11.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.866 | 202] 1.5 [DL + RSX] | 5909.2888 | 80.8252 | -36.0103 |
| Bottom | 0.887 | 202] 1.5 [DL + RSX] | 5973.0575 | -85.5426 | -204.4717 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5346.6713 | 126.7642 | -103.9924 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5410.4399 | 226.2956 | -104.8406 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5909.2888 | -36.0103 | 11.17 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5909.2888 | 108.4178 | 11.61 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5973.0575 | -204.4717 | 12.32 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5973.0575 | 134.1843 | 11.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.9 | 202] 1.5 [DL + RSX] | 6159.6159 | 77.368 | -16.3268 |
| Bottom | 0.92 | 202] 1.5 [DL + RSX] | 6223.3846 | -83.5613 | -234.7522 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5565.6387 | 107.7043 | -99.7242 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5629.4074 | 255.8714 | -100.4332 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6159.6159 | -16.3268 | 11.51 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6159.6159 | 77.8867 | 11.89 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6223.3846 | -234.7522 | 12.97 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6223.3846 | 166.5127 | 12.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.933 | 202] 1.5 [DL + RSX] | 6407.4528 | 71.7761 | -7.4357 |
| Bottom | 0.954 | 202] 1.5 [DL + RSX] | 6473.2458 | -82.4844 | -250.5222 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5778.3724 | 118.664 | -83.3904 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5844.1655 | 313.9036 | -83.917 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6407.4528 | -7.4357 | 11.91 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6407.4528 | 59.4299 | 12.23 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6473.2458 | -250.5222 | 13.53 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6473.2458 | 229.4446 | 13.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.104 | 202] 1.5 [DL + RSX] | 6652.0635 | 228.3899 | 121.9492 |
| Bottom | 1.157 | 202] 1.5 [DL + RSX] | 6737.0884 | -230.8897 | -390.3202 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5479.0427 | 121.9492 | -80.4935 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5564.0676 | 349.8838 | -80.5493 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6652.0635 | -37.042 | 12.55 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6652.0635 | 121.9492 | 13.07 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6737.0884 | -390.3202 | 14.89 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6737.0884 | 349.8838 | 14.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.148 | 202] 1.5 [DL + RSX] | 6937.4263 | 220.2593 | 281.6501 |
| Bottom | 1.197 | 202] 1.5 [DL + RSX] | 7018.8073 | 222.4513 | -553.5776 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5731.8157 | 281.6501 | -83.818 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5813.1967 | 498.6005 | -83.8275 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6937.4263 | -210.3803 | 14.15 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6937.4263 | 281.6501 | 14.59 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7018.8073 | -553.5776 | 16.41 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7018.8073 | 498.6005 | 16.08 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.757 | 202] 1.5 [DL + RSX] | 1213.3646 | -129.8258 | 190.7234 |
| Bottom | 0.574 | 202] 1.5 [DL + RSX] | 1395.037 | 116.7816 | 37.2386 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1120.1818 | 188.1399 | -58.4829 | 116.9262 | 376.7523 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1162.6942 | 46.394 | -58.7985 | 117.9793 | 377.8054 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1445.7074 | 188.1399 | 6.63 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1488.2199 | -19.0038 | 4.4 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1488.2199 | 46.394 | 4.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.573 | 202] 1.5 [DL + RSX] | 1606.3261 | -109.441 | -53.2342 |
| Bottom | 0.575 | 202] 1.5 [DL + RSX] | 1648.8386 | 110.3925 | 37.2009 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1352.3253 | 41.4232 | 29.665 | 122.6768 | 382.5029 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1394.8378 | 52.0089 | 30.026 | 123.7299 | 383.556 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1694.4988 | -66.1707 | 5.63 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1694.4988 | 41.4232 | 5.28 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1737.0112 | -28.6473 | 5.22 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1737.0112 | 52.0089 | 5.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 202] 1.5 [DL + RSX] | 1864.9793 | -111.3193 | -60.9936 |
| Bottom | 0.609 | 202] 1.5 [DL + RSX] | 1907.4918 | 110.0684 | 39.9942 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1582.1456 | 40.9712 | 32.5043 | 128.3698 | 388.1959 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1624.6581 | 60.88 | 32.9102 | 129.4229 | 389.249 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1942.8994 | -72.2131 | 6.4 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1942.8994 | 40.9712 | 5.97 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1985.4119 | -29.4701 | 5.92 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1985.4119 | 60.88 | 6.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.645 | 202] 1.5 [DL + RSX] | 2125.8672 | -109.5232 | -60.6832 |
| Bottom | 0.64 | 202] 1.5 [DL + RSX] | 2168.3796 | 108.6778 | 39.3192 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1809.8565 | 46.3986 | 31.4941 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1852.369 | 62.8999 | 31.9578 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2190.2249 | -70.6197 | 7.06 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2190.2249 | 46.3986 | 6.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2232.7373 | -33.113 | 6.66 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2232.7373 | 62.8999 | 7.08 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.684 | 202] 1.5 [DL + RSX] | 2387.7044 | -108.6313 | -63.9515 |
| Bottom | 0.683 | 202] 1.5 [DL + RSX] | 2430.2168 | 107.6954 | 41.2606 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2035.8269 | 46.6008 | 32.2284 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2078.3394 | 64.5601 | 32.7442 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2436.4341 | -73.1467 | 7.78 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2436.4341 | 46.6008 | 7.42 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2478.9465 | -34.5955 | 7.37 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2478.9465 | 64.5601 | 7.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.727 | 202] 1.5 [DL + RSX] | 2649.9319 | -107.606 | -65.8774 |
| Bottom | 0.727 | 202] 1.5 [DL + RSX] | 2692.4444 | 106.7198 | 43.8185 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2260.1852 | 47.1637 | 32.8285 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2302.6977 | 65.8747 | 33.3697 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2681.6516 | -74.359 | 8.48 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2681.6516 | 47.1637 | 8.1 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2724.164 | -35.5629 | 8.06 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2724.164 | 65.8747 | 8.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 202] 1.5 [DL + RSX] | 2912.2689 | -106.6145 | -67.2687 |
| Bottom | 0.729 | 202] 1.5 [DL + RSX] | 2954.7813 | 105.776 | 46.2493 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2482.8198 | 47.2311 | 33.4281 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2525.3322 | 67.2901 | 33.9577 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2926.0825 | -74.8738 | 9.17 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2926.0825 | 47.2311 | 8.78 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2968.595 | -36.7037 | 8.76 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2968.595 | 67.2901 | 9.18 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.771 | 202] 1.5 [DL + RSX] | 3174.5724 | -105.5673 | -67.8994 |
| Bottom | 0.77 | 202] 1.5 [DL + RSX] | 3217.0849 | 104.8185 | 48.803 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2703.5131 | 46.7475 | 33.8728 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2746.0256 | 68.7603 | 34.3564 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3174.5724 | -67.8994 | 9.76 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3174.5724 | 39.7858 | 9.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3217.0849 | -18.3652 | 9.19 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3217.0849 | 48.803 | 9.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.833 | 202] 1.5 [DL + RSX] | 3436.7274 | -104.3818 | -67.51 |
| Bottom | 0.838 | 202] 1.5 [DL + RSX] | 3479.2399 | 103.7755 | 51.556 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2921.9849 | 45.8818 | 33.8517 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2964.4974 | 69.1872 | 34.265 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3436.7274 | -67.51 | 10.48 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3436.7274 | 38.512 | 10.08 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3479.2399 | -23.5503 | 9.99 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3479.2399 | 51.556 | 10.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.88 | 202] 1.5 [DL + RSX] | 3698.6025 | -102.9789 | -66.749 |
| Bottom | 0.886 | 202] 1.5 [DL + RSX] | 3741.115 | 102.305 | 65.8011 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3137.9227 | 44.1611 | 37.3156 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3180.4352 | 79.5978 | 37.6479 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3698.6025 | -66.749 | 11.2 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3698.6025 | 34.3458 | 10.75 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3741.115 | -20.5103 | 10.68 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3741.115 | 65.8011 | 11.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.902 | 202] 1.5 [DL + RSX] | 3959.8648 | -102.0426 | -53.6575 |
| Bottom | 0.915 | 202] 1.5 [DL + RSX] | 4002.3772 | 100.8679 | 106.5842 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3350.9349 | 53.6631 | 46.6656 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3393.4473 | 118.03 | 46.9113 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3959.8648 | -53.6575 | 11.74 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3959.8648 | 38.7748 | 11.54 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4002.3772 | -3.8258 | 11.17 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4002.3772 | 106.5842 | 12.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.95 | 202] 1.5 [DL + RSX] | 4217.8492 | -101.5077 | 63.2124 |
| Bottom | 1.01 | 202] 1.5 [DL + RSX] | 4260.3616 | 105.8269 | -294.3434 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3558.8098 | 82.8237 | -106.1828 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3601.3222 | -169.7263 | -106.2839 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4217.8492 | -10.8807 | 11.87 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4217.8492 | 63.2124 | 12.59 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4260.3616 | -294.3434 | 15.92 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.953 | 202] 1.5 [DL + RSX] | 4506.8586 | -165.3776 | 776.3736 |
| Bottom | 0.829 | 202] 1.5 [DL + RSX] | 4567.1207 | 156.9672 | 137.8286 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3680.7947 | 776.3736 | -232.5561 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3741.0569 | 137.8286 | -232.6664 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4506.8586 | 776.3736 | 14.2 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4567.1207 | -33.4241 | 9.18 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4567.1207 | 137.8286 | 9.9 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 202] 1.5 [DL + RSX] | 4811.9045 | -153.1298 | 76.7418 |
| Bottom | 0.855 | 202] 1.5 [DL + RSX] | 4872.1667 | 154.2771 | -101.5417 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4007.7224 | 115.2836 | -51.1384 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4067.9846 | 102.0401 | -51.5112 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4811.9045 | -22.8128 | 9.59 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4811.9045 | 76.7418 | 9.96 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4872.1667 | -101.5417 | 10.25 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4872.1667 | 49.4441 | 9.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.882 | 202] 1.5 [DL + RSX] | 5116.6286 | -149.203 | -110.0747 |
| Bottom | 0.889 | 202] 1.5 [DL + RSX] | 5176.8908 | 150.7173 | 82.3047 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4231.5108 | 42.0529 | 58.168 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4291.773 | 145.1149 | 58.7623 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5116.6286 | -110.0747 | 10.79 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5116.6286 | 2.153 | 10.04 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5176.8908 | -59.4201 | 10.56 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5176.8908 | 82.3047 | 10.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.914 | 202] 1.5 [DL + RSX] | 5420.7371 | -144.893 | -76.765 |
| Bottom | 0.926 | 202] 1.5 [DL + RSX] | 5480.9992 | 146.6425 | 91.4473 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4453.3333 | 73.7228 | 51.3049 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4513.5955 | 161.4277 | 52.0809 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5420.7371 | -76.765 | 11.15 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5420.7371 | 36.0914 | 10.87 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5480.9992 | -49.9214 | 11.09 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5480.9992 | 91.4473 | 11.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.948 | 202] 1.5 [DL + RSX] | 5723.319 | -140.4021 | -65.6422 |
| Bottom | 0.962 | 202] 1.5 [DL + RSX] | 5783.5811 | 142.5569 | 95.7059 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4672.8981 | 74.4711 | 48.754 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4733.1602 | 169.6298 | 49.6451 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5723.319 | -65.6422 | 11.67 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5723.319 | 39.8312 | 11.49 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5783.5811 | -55.7012 | 11.72 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5783.5811 | 95.7059 | 12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.98 | 202] 1.5 [DL + RSX] | 6023.9555 | -134.923 | -60.7864 |
| Bottom | 0.998 | 202] 1.5 [DL + RSX] | 6084.2176 | 137.7043 | 106.3239 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4890.6756 | 64.5657 | 49.1062 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4950.9377 | 181.3934 | 50.0322 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6023.9555 | -60.7864 | 12.22 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6023.9555 | 29.8027 | 12.01 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6084.2176 | -66.927 | 12.39 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6084.2176 | 106.3239 | 12.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.011 | 202] 1.5 [DL + RSX] | 6322.1089 | -128.712 | -53.1825 |
| Bottom | 1.034 | 202] 1.5 [DL + RSX] | 6382.371 | 132.5838 | 125.6554 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5107.3428 | 59.2323 | 49.7803 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5167.6049 | 199.543 | 50.6545 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6322.1089 | -53.1825 | 12.76 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6322.1089 | 17.2108 | 12.51 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6382.371 | -82.4628 | 13.08 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6382.371 | 125.6554 | 13.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.039 | 202] 1.5 [DL + RSX] | 6616.9703 | -120.5514 | -49.3918 |
| Bottom | 1.066 | 202] 1.5 [DL + RSX] | 6677.2324 | 123.5336 | 145.5 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5323.7065 | 66.9473 | 47.5091 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5383.9686 | 216.4173 | 48.2502 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6616.9703 | -49.3918 | 13.31 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6616.9703 | 12.3202 | 13.05 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6677.2324 | -115.3028 | 13.88 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6677.2324 | 145.5 | 14.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.08 | 202] 1.5 [DL + RSX] | 6908.4426 | -116.8628 | -77.0511 |
| Bottom | 1.131 | 202] 1.5 [DL + RSX] | 6970.6179 | 137.3797 | -245.3549 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5541.4513 | 82.1754 | -53.2877 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5603.6265 | 208.8993 | -53.8172 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6908.4426 | -77.0511 | 14.07 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6908.4426 | 22.1978 | 13.69 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6675.3746 | -318.2942 | 15.28 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6970.6179 | 135.96 | 14.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.368 | 202] 1.5 [DL + RSX] | 7379.5859 | -272.0066 | 213.6069 |
| Bottom | 1.414 | 202] 1.5 [DL + RSX] | 7459.9354 | 274.3689 | -419.5895 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5627.3172 | 213.6069 | -113.2769 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5707.6667 | 176.5012 | -113.3298 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 4453.1612 | -51.9527 | 9.09 | 6 |
| Top–Right | Leg 1 | 600 | 207] [0.9 DL + 1.5 RSY] | 7379.5859 | 213.6069 | 15.94 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7459.9354 | -419.5895 | 17.52 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7459.9354 | 176.5012 | 15.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.387 | 202] 1.5 [DL + RSX] | 7856.7515 | -237.8504 | 317.1055 |
| Bottom | 1.425 | 202] 1.5 [DL + RSX] | 7933.6575 | 239.9218 | -481.8218 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6042.0981 | 317.1055 | -90.4862 | 198.4119 | 566.7199 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6119.0041 | 395.1105 | -90.495 | 198.4119 | 566.7199 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7856.7515 | -111.6822 | 16.17 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7856.7515 | 317.1055 | 17.59 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7933.6575 | -481.8218 | 18.88 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7933.6575 | 395.1105 | 18.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.931 | 202] 1.5 [DL + RSX] | 2157.572 | 153.086 | 332.4131 |
| Bottom | 0.768 | 202] 1.5 [DL + RSX] | 2200.0844 | -146.9201 | 52.6179 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1993.6203 | 384.0935 | -139.0837 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2036.1327 | 97.8328 | -139.5064 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2157.572 | 332.4131 | 10.61 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2200.0844 | -22.1168 | 6.42 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2200.0844 | 52.6179 | 6.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.806 | 202] 1.5 [DL + RSX] | 2337.5277 | 141.4943 | -147.6818 |
| Bottom | 0.795 | 202] 1.5 [DL + RSX] | 2380.0401 | -141.8609 | 100.3356 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2146.1886 | -11.1917 | 103.2735 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2188.701 | 149.8232 | 103.7443 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2337.5277 | -60.8708 | 7.34 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1351.2937 | 30.5189 | 4.18 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2268.1768 | -14.1792 | 6.5 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2380.0401 | 100.3356 | 8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.823 | 202] 1.5 [DL + RSX] | 2528.9032 | 144.4815 | -100.6287 |
| Bottom | 0.822 | 202] 1.5 [DL + RSX] | 2571.4156 | -143.4613 | 91.6822 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2297.5043 | 46.2377 | 85.9546 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2340.0168 | 144.8331 | 86.3833 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2528.9032 | -3.354 | 7.07 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2406.0795 | 46.2377 | 7.33 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2448.5919 | -26.6051 | 7.17 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2571.4156 | 91.6822 | 8.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.852 | 202] 1.5 [DL + RSX] | 2729.6847 | 144.2063 | -106.9789 |
| Bottom | 0.848 | 202] 1.5 [DL + RSX] | 2772.1971 | -143.5004 | 90.5266 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2451.9613 | 44.0299 | 86.9206 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2494.4737 | 145.1227 | 87.3562 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2729.6847 | -4.2353 | 7.64 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2600.8492 | 44.0299 | 7.84 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2643.3616 | -31.2985 | 7.78 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2772.1971 | 90.5266 | 8.96 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.829 | 202] 1.5 [DL + RSX] | 2940.0751 | 144.2179 | -106.6069 |
| Bottom | 0.829 | 202] 1.5 [DL + RSX] | 2982.5875 | -143.4583 | 90.1076 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2612.8095 | 47.3323 | 85.9592 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2655.3219 | 144.7305 | 86.4064 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2940.0751 | -0.1994 | 8.17 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2807.1902 | 47.3323 | 8.46 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2849.7027 | -35.4866 | 8.41 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2982.5875 | 90.1076 | 9.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 202] 1.5 [DL + RSX] | 3160.0401 | 144.0256 | -106.0157 |
| Bottom | 0.865 | 202] 1.5 [DL + RSX] | 3202.5526 | -143.2502 | 90.0211 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2780.784 | 50.1323 | 85.113 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2823.2964 | 144.3051 | 85.5647 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3160.0401 | -106.0157 | 10.25 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3160.0401 | 3.1916 | 8.82 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3066.7448 | -39.5119 | 9.07 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3202.5526 | 90.0211 | 10.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.9 | 202] 1.5 [DL + RSX] | 3389.7652 | 143.6245 | -105.0129 |
| Bottom | 0.901 | 202] 1.5 [DL + RSX] | 3432.2777 | -142.8589 | 90.0012 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2956.1218 | 52.4351 | 84.2117 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2998.6343 | 144.0812 | 84.6501 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3389.7652 | -105.0129 | 10.87 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3389.7652 | 6.2908 | 9.5 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3294.5627 | -43.7167 | 9.76 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3432.2777 | 90.0012 | 10.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 202] 1.5 [DL + RSX] | 3629.5242 | 142.9418 | -103.4257 |
| Bottom | 0.939 | 202] 1.5 [DL + RSX] | 3672.0367 | -142.2139 | 90.2206 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3138.9214 | 54.1655 | 83.1648 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3181.4339 | 144.0767 | 83.5703 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3629.5242 | -103.4257 | 11.52 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3629.5242 | 8.9021 | 10.21 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3533.5429 | -48.1333 | 10.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3672.0367 | 90.2206 | 11.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.976 | 202] 1.5 [DL + RSX] | 3879.7088 | 141.9589 | -100.8937 |
| Bottom | 0.979 | 202] 1.5 [DL + RSX] | 3922.2212 | -141.3022 | 91.2275 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3329.3403 | 55.5296 | 81.9417 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3371.8528 | 144.2801 | 82.301 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3879.7088 | -100.8937 | 12.18 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3879.7088 | 10.7774 | 10.93 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3784.2475 | -52.5386 | 11.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3922.2212 | 91.2275 | 12.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.014 | 202] 1.5 [DL + RSX] | 4140.7979 | 140.5879 | -96.8008 |
| Bottom | 1.018 | 202] 1.5 [DL + RSX] | 4183.3103 | -140.1059 | 89.0886 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3527.6531 | 56.9218 | 79.0345 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3570.1655 | 140.0714 | 79.3441 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4140.7979 | -96.8008 | 12.85 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4140.7979 | 11.6646 | 11.66 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4183.3103 | -10.8284 | 11.77 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4183.3103 | 89.0886 | 12.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.054 | 202] 1.5 [DL + RSX] | 4413.1856 | 138.376 | -95.6196 |
| Bottom | 1.073 | 202] 1.5 [DL + RSX] | 4455.6981 | -138.1635 | 137.7669 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3733.9529 | 52.9447 | 93.2492 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3776.4653 | 184.9866 | 93.5261 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4413.1856 | -95.6196 | 13.59 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4413.1856 | 5.1433 | 12.33 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4323.4869 | -14.8289 | 12.22 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4455.6981 | 137.7669 | 14.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.094 | 202] 1.5 [DL + RSX] | 4698.2842 | 135.8728 | 60.6177 |
| Bottom | 1.151 | 202] 1.5 [DL + RSX] | 4740.7966 | -135.576 | -286.1706 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3949.8658 | 112.9865 | -133.0121 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3992.3783 | -69.5445 | -133.1367 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4698.2842 | -35.2276 | 13.54 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4698.2842 | 60.6177 | 13.89 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4740.7966 | -286.1706 | 17.14 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2893.1381 | 13.3017 | 8.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.096 | 202] 1.5 [DL + RSX] | 4974.1336 | 196.9795 | 922.3509 |
| Bottom | 0.937 | 202] 1.5 [DL + RSX] | 5034.3588 | -189.7949 | -123.2233 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4176.678 | 956.6307 | -357.0874 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4236.9032 | 133.7808 | -357.1057 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4974.1336 | 922.3509 | 16.14 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5034.3588 | -123.2233 | 10.72 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5034.3588 | 46.7302 | 10.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.939 | 202] 1.5 [DL + RSX] | 5260.3199 | 174.3573 | -126.8458 |
| Bottom | 0.943 | 202] 1.5 [DL + RSX] | 5320.5451 | -177.3428 | 83.0469 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4422.9092 | 46.7014 | 92.5575 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4483.1345 | 182.0276 | 92.9942 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5260.3199 | -20.8845 | 10.46 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5167.7969 | 46.7014 | 10.46 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5320.5451 | -68.2002 | 10.9 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5320.5451 | 83.0469 | 11.01 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.97 | 202] 1.5 [DL + RSX] | 5554.1438 | 174.4202 | -81.7625 |
| Bottom | 0.979 | 202] 1.5 [DL + RSX] | 5614.369 | -175.2539 | 89.0424 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4675.4006 | 94.7359 | 80.0402 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4735.6258 | 195.7325 | 80.6246 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5554.1438 | -81.7625 | 11.46 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5554.1438 | 30.9002 | 11.1 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5614.369 | -51.2511 | 11.36 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5614.369 | 89.0424 | 11.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.001 | 202] 1.5 [DL + RSX] | 5856.5512 | 169.1359 | -64.5545 |
| Bottom | 1.013 | 202] 1.5 [DL + RSX] | 5916.7765 | -170.817 | 81.8579 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4935.1482 | 106.1686 | 71.7672 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4995.3734 | 194.6773 | 72.4701 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5856.5512 | -64.5545 | 11.93 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5856.5512 | 50.6892 | 11.83 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5916.7765 | -56.0026 | 11.99 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5916.7765 | 81.8579 | 12.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.035 | 202] 1.5 [DL + RSX] | 6168.0784 | 163.1753 | -59.1882 |
| Bottom | 1.048 | 202] 1.5 [DL + RSX] | 6228.3036 | -165.4002 | 79.1927 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5202.9722 | 95.7211 | 68.151 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5263.1974 | 197.5173 | 68.9298 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6168.0784 | -59.1882 | 12.5 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6168.0784 | 50.3724 | 12.44 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6228.3036 | -62.4782 | 12.64 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6228.3036 | 79.1927 | 12.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.067 | 202] 1.5 [DL + RSX] | 6489.2842 | 156.125 | -48.7425 |
| Bottom | 1.083 | 202] 1.5 [DL + RSX] | 6549.5094 | -158.921 | 79.5584 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5479.8799 | 83.258 | 63.3973 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5540.1052 | 203.5875 | 64.1939 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6489.2842 | -48.7425 | 13.06 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6489.2842 | 48.2216 | 13.06 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6549.5094 | -72.523 | 13.34 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6549.5094 | 79.5584 | 13.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.099 | 202] 1.5 [DL + RSX] | 6820.8829 | 147.9285 | 42.6107 |
| Bottom | 1.12 | 202] 1.5 [DL + RSX] | 6881.1081 | -151.7727 | -88.3315 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5767.3414 | 71.3002 | -62.1654 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5827.5666 | 212.8035 | -62.9094 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6841.8805 | -63.215 | 13.85 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6841.8805 | 71.3002 | 13.91 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6881.1081 | -88.3315 | 14.1 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6881.1081 | 82.412 | 14.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.129 | 202] 1.5 [DL + RSX] | 7163.6916 | 136.9752 | 33.1955 |
| Bottom | 1.155 | 202] 1.5 [DL + RSX] | 7223.9168 | -140.5457 | -104.6056 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6067.351 | 71.1297 | -60.2336 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6127.5762 | 235.534 | -60.8632 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7207.917 | -56.7966 | 14.53 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7207.917 | 71.1297 | 14.63 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7268.1423 | -241.2053 | 15.92 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7268.1423 | 235.534 | 15.88 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.174 | 202] 1.5 [DL + RSX] | 7519.2307 | 129.4015 | -7.5937 |
| Bottom | 1.211 | 202] 1.5 [DL + RSX] | 7581.3678 | -145.3422 | -125.4192 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6382.9504 | 107.3589 | -56.3786 | 198.2904 | 566.3728 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6445.0876 | 253.793 | -56.8623 | 198.2904 | 566.3728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7585.3736 | -70.7444 | 15.36 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7585.3736 | 107.3589 | 15.62 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7647.5107 | -266.2235 | 16.84 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7647.5107 | 253.793 | 16.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.423 | 202] 1.5 [DL + RSX] | 7929.1038 | 302.6263 | 80.0712 |
| Bottom | 1.461 | 202] 1.5 [DL + RSX] | 8009.4041 | 304.9871 | -233.2011 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6756.5331 | 162.4376 | -61.9465 | 222.2709 | 590.3533 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6836.8334 | 296.0518 | -62.2643 | 222.2709 | 590.3533 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8014.9396 | -100.854 | 16.41 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8014.9396 | 162.4376 | 16.84 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8095.2399 | -380.4568 | 18.51 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8095.2399 | 296.0518 | 17.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.436 | 202] 1.5 [DL + RSX] | 8374.9897 | 267.5679 | 182.6532 |
| Bottom | 1.469 | 203] 1.5 [DL + RSY] | 8548.236 | -244.213 | -497.4276 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7186.5436 | 282.1133 | -79.3102 | 222.2709 | 590.3533 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7263.4024 | 435.4497 | -79.3655 | 222.2709 | 590.3533 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8471.3771 | -170.9134 | 17.79 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8471.3771 | 282.1133 | 18.56 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8548.236 | -497.4276 | 20.2 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8548.236 | 435.4497 | 19.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.96 | 202] 1.5 [DL + RSX] | 1502.9417 | -163.3172 | 242.558 |
| Bottom | 0.765 | 202] 1.5 [DL + RSX] | 1685.6801 | 157.0942 | 60.7573 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1515.6274 | 297.3672 | -110.2194 | 126.6477 | 386.2573 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1558.1044 | 104.4069 | -110.6482 | 127.7 | 387.3095 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1001.2884 | -4.0023 | 2.84 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1643.2031 | 242.558 | 7.94 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1685.6801 | -17.8559 | 4.93 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1672.9944 | 104.4069 | 6.1 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.794 | 202] 1.5 [DL + RSX] | 1858.3648 | -150.8617 | -136.6258 |
| Bottom | 0.777 | 202] 1.5 [DL + RSX] | 1900.8418 | 151.2928 | 97.3559 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1720.3953 | 5.1199 | 98.5852 | 131.7202 | 391.3297 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1762.8724 | 144.7165 | 99.0572 | 132.7724 | 392.3819 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1858.3648 | -136.6258 | 7.07 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1802.3708 | 5.1199 | 5.08 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1844.8478 | -21.0802 | 5.42 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1900.8418 | 97.3559 | 6.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.799 | 202] 1.5 [DL + RSX] | 2082.6243 | -153.5186 | -101.0356 |
| Bottom | 0.792 | 202] 1.5 [DL + RSX] | 2125.1014 | 152.5144 | 90.8824 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1916.9455 | 49.9198 | 85.6952 | 133.6549 | 393.2645 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1959.4225 | 141.9582 | 86.1287 | 133.6549 | 393.2645 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2082.6243 | -101.0356 | 7.2 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1997.3512 | 49.9198 | 6.25 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2039.8283 | -31.1057 | 6.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2125.1014 | 90.8824 | 7.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.822 | 202] 1.5 [DL + RSX] | 2313.3688 | -152.7742 | -106.3612 |
| Bottom | 0.819 | 202] 1.5 [DL + RSX] | 2355.8458 | 152.0946 | 90.2334 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2103.0489 | 48.5902 | 86.536 | 133.6549 | 393.2645 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2145.5259 | 142.7802 | 86.9791 | 133.6549 | 393.2645 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2313.3688 | -106.3612 | 7.91 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2313.3688 | 0.4849 | 6.44 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2256.3941 | -35.0931 | 6.76 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2355.8458 | 90.2334 | 7.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.801 | 202] 1.5 [DL + RSX] | 2550.7385 | -152.3226 | -106.2613 |
| Bottom | 0.798 | 202] 1.5 [DL + RSX] | 2593.2156 | 151.5983 | 90.2063 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2287.9309 | 51.3183 | 85.8595 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2330.4079 | 142.9154 | 86.3135 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2550.7385 | -106.2613 | 8.57 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2550.7385 | 3.924 | 7.15 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2486.4637 | -38.7108 | 7.45 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2593.2156 | 90.2063 | 8.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.831 | 202] 1.5 [DL + RSX] | 2794.892 | -151.6721 | -105.8697 |
| Bottom | 0.828 | 202] 1.5 [DL + RSX] | 2837.369 | 150.9404 | 90.3787 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2476.0158 | 53.5159 | 85.2211 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2518.4928 | 142.9888 | 85.6752 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2794.892 | -105.8697 | 9.24 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2794.892 | 6.8292 | 7.87 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2726.1017 | -42.4189 | 8.17 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2837.369 | 90.3787 | 9.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.861 | 202] 1.5 [DL + RSX] | 3046.2404 | -150.8055 | -105.0851 |
| Bottom | 0.862 | 202] 1.5 [DL + RSX] | 3088.7174 | 150.0954 | 90.5354 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2668.8539 | 55.1199 | 84.4754 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2711.3309 | 143.2604 | 84.9087 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3046.2404 | -105.0851 | 9.93 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3046.2404 | 9.4314 | 8.6 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2974.5894 | -46.5078 | 8.92 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3088.7174 | 90.5354 | 9.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.899 | 202] 1.5 [DL + RSX] | 3305.2906 | -149.6483 | -103.7304 |
| Bottom | 0.902 | 202] 1.5 [DL + RSX] | 3347.7676 | 148.9895 | 90.8535 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2867.1487 | 56.1415 | 83.5245 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2909.6257 | 143.7001 | 83.9172 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3305.2906 | -103.7304 | 10.63 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3305.2906 | 11.5445 | 9.35 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3232.1634 | -50.9331 | 9.69 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3347.7676 | 90.8535 | 10.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.939 | 202] 1.5 [DL + RSX] | 3572.6548 | -148.1768 | -101.4602 |
| Bottom | 0.942 | 202] 1.5 [DL + RSX] | 3615.1319 | 147.6043 | 91.8679 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3071.4281 | 56.8512 | 82.3422 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3113.9052 | 144.2094 | 82.6839 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3572.6548 | -101.4602 | 11.34 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3572.6548 | 12.9092 | 10.11 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3615.1319 | -3.034 | 10.09 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3615.1319 | 91.8679 | 11.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.979 | 202] 1.5 [DL + RSX] | 3849.0158 | -146.3008 | -97.6833 |
| Bottom | 0.983 | 202] 1.5 [DL + RSX] | 3891.4929 | 145.9185 | 89.9574 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3282.2325 | 57.6731 | 79.5397 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3324.7095 | 140.4137 | 79.8314 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3849.0158 | -97.6833 | 12.06 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3849.0158 | 13.2519 | 10.88 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3891.4929 | -13.8451 | 11.01 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3891.4929 | 89.9574 | 12.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.02 | 202] 1.5 [DL + RSX] | 4134.9695 | -143.5646 | -96.5229 |
| Bottom | 1.037 | 202] 1.5 [DL + RSX] | 4177.4465 | 143.4533 | 136.0129 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3499.8723 | 53.6149 | 92.9862 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3542.3494 | 183.1711 | 93.2504 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4134.9695 | -96.5229 | 12.84 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4134.9695 | 6.5373 | 11.59 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4065.9513 | -19.8435 | 11.58 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4177.4465 | 136.0129 | 13.51 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 202] 1.5 [DL + RSX] | 4432.1092 | -140.5396 | 58.7474 |
| Bottom | 1.115 | 202] 1.5 [DL + RSX] | 4474.5862 | 140.4909 | -280.2766 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3726.1354 | 110.2286 | -130.0418 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3768.6124 | -61.3252 | -130.1624 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4432.1092 | -39.2898 | 12.87 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4432.1092 | 58.7474 | 13.14 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4474.5862 | -280.2766 | 16.34 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2740.6587 | 18.484 | 7.88 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.076 | 202] 1.5 [DL + RSX] | 4717.5247 | -203.778 | 876.1898 |
| Bottom | 0.917 | 202] 1.5 [DL + RSX] | 4777.7861 | 196.4168 | -121.2317 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3962.2097 | 913.7434 | -342.4706 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4022.4711 | 141.43 | -342.4883 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4717.5247 | 876.1898 | 15.3 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4777.7861 | -121.2317 | 10.2 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4777.7861 | 55.3205 | 9.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.918 | 202] 1.5 [DL + RSX] | 5013.444 | -180.1305 | -121.1012 |
| Bottom | 0.924 | 202] 1.5 [DL + RSX] | 5073.7054 | 183.2312 | 87.4383 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4218.1291 | 54.7085 | 91.1742 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4278.3905 | 184.1731 | 91.6258 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5013.444 | -13.5256 | 9.92 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4937.779 | 54.7085 | 10.05 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5073.7054 | -71.004 | 10.43 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5073.7054 | 87.4383 | 10.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 202] 1.5 [DL + RSX] | 5316.0459 | -179.7661 | -79.4643 |
| Bottom | 0.956 | 202] 1.5 [DL + RSX] | 5376.3073 | 180.68 | 91.973 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4479.6727 | 98.762 | 79.4538 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4539.9341 | 195.6947 | 80.0544 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5316.0459 | -79.4643 | 10.97 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5316.0459 | 33.874 | 10.65 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5376.3073 | -55.5349 | 10.92 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5376.3073 | 91.973 | 11.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.977 | 202] 1.5 [DL + RSX] | 5626.3098 | -173.9277 | -63.3585 |
| Bottom | 0.989 | 202] 1.5 [DL + RSX] | 5686.5712 | 175.7155 | 84.5031 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4747.7791 | 108.4797 | 71.5066 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4808.0405 | 193.8809 | 72.2236 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5626.3098 | -63.3585 | 11.46 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5626.3098 | 52.0442 | 11.39 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5686.5712 | -60.4003 | 11.56 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5686.5712 | 84.5031 | 11.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.01 | 202] 1.5 [DL + RSX] | 5944.8551 | -167.4278 | -57.9097 |
| Bottom | 1.024 | 202] 1.5 [DL + RSX] | 6005.1165 | 169.7693 | 81.4421 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5023.3097 | 97.3739 | 67.8069 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5083.5711 | 196.1053 | 68.5941 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5944.8551 | -57.9097 | 12.05 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5944.8551 | 51.3301 | 12 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6005.1165 | -67.0315 | 12.23 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6005.1165 | 81.4421 | 12.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.043 | 202] 1.5 [DL + RSX] | 6272.3219 | -159.8378 | 48.6709 |
| Bottom | 1.059 | 202] 1.5 [DL + RSX] | 6332.5833 | 162.7685 | 81.2967 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5307.3052 | 84.1227 | 62.9616 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5367.5666 | 201.6928 | 63.7595 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6279.4463 | -82.8617 | 12.88 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6279.4463 | 84.1227 | 12.89 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6339.7077 | -197.5979 | 13.79 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6339.7077 | 201.6928 | 13.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.075 | 202] 1.5 [DL + RSX] | 6609.4837 | -151.0721 | 42.4623 |
| Bottom | 1.096 | 202] 1.5 [DL + RSX] | 6669.7451 | 155.0446 | -93.2961 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5601.2449 | 71.3463 | -63.195 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5661.5063 | 210.1118 | -63.9348 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6638.4146 | -62.0481 | 13.44 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6638.4146 | 71.3463 | 13.5 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6698.676 | -220.2106 | 14.65 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6698.676 | 210.1118 | 14.58 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.105 | 202] 1.5 [DL + RSX] | 6957.1959 | -139.5847 | 32.2103 |
| Bottom | 1.131 | 202] 1.5 [DL + RSX] | 7017.4573 | 143.4928 | -107.8695 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5907.095 | 70.1849 | -60.5549 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5967.3564 | 233.7715 | -61.1776 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7007.3794 | -55.8074 | 14.12 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7007.3794 | 70.1849 | 14.22 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7017.4573 | -107.8695 | 14.5 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7017.4573 | 100.595 | 14.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.144 | 202] 1.5 [DL + RSX] | 7315.5274 | -129.8322 | -6.6345 |
| Bottom | 1.185 | 202] 1.5 [DL + RSX] | 7377.7018 | 144.3153 | -140.926 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6226.3149 | 106.4001 | -61.0191 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6288.4893 | 238.2956 | -61.4948 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7385.7515 | -68.947 | 14.95 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7385.7515 | 106.4001 | 15.21 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7447.9259 | -279.4076 | 16.53 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7447.9259 | 238.2956 | 16.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.382 | 202] 1.5 [DL + RSX] | 7718.0007 | 291.8354 | 85.8256 |
| Bottom | 1.417 | 202] 1.5 [DL + RSX] | 7798.3492 | 294.1976 | -216.7454 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6592.7357 | 167.1599 | -60.0835 | 222.4043 | 590.7078 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6673.0842 | 320.212 | -60.394 | 222.4043 | 590.7078 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7806.3246 | -93.1328 | 15.94 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7806.3246 | 167.1599 | 16.45 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7886.6731 | -364.8642 | 17.98 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7886.6731 | 320.212 | 17.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.398 | 202] 1.5 [DL + RSX] | 8198.6992 | 257.147 | 159.3655 |
| Bottom | 1.431 | 202] 1.5 [DL + RSX] | 8275.6043 | 259.2183 | -307.9299 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7057.401 | 259.9189 | -72.8824 | 222.4043 | 590.7078 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7134.306 | 452.253 | -72.9365 | 222.4043 | 590.7078 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8298.1276 | -198.4621 | 17.63 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8298.1276 | 259.9189 | 18.06 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8375.0326 | -499.3438 | 19.86 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8375.0326 | 452.253 | 19.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.661 | 202] 1.5 [DL + RSX] | 1180.3896 | 115.7937 | 180.5853 |
| Bottom | 0.521 | 202] 1.5 [DL + RSX] | 1362.2261 | -104.1248 | 37.0298 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1089.4227 | 178.2796 | -55.5809 | 116.09 | 375.6995 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1131.8997 | 45.9605 | -55.8391 | 117.1422 | 376.7518 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1410.7161 | 178.2796 | 6.4 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1453.1931 | -19.396 | 4.31 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1453.1931 | 45.9605 | 4.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.537 | 202] 1.5 [DL + RSX] | 1563.8282 | 99.0085 | -59.3041 |
| Bottom | 0.537 | 202] 1.5 [DL + RSX] | 1606.3053 | -99.8165 | 38.9668 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1314.7305 | 37.2083 | 32.1616 | 121.6712 | 381.2808 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1357.2075 | 53.6756 | 32.5171 | 122.7234 | 382.333 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1654.2045 | -72.9035 | 5.61 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1654.2045 | 37.2083 | 5.12 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1696.6815 | -27.648 | 5.1 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1696.6815 | 53.6756 | 5.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.58 | 202] 1.5 [DL + RSX] | 1814.4761 | 101.3308 | -65.2823 |
| Bottom | 0.573 | 202] 1.5 [DL + RSX] | 1856.9531 | -100.2875 | 42.3268 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1538.7201 | 38.7786 | 34.5883 | 127.2198 | 386.8293 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1581.1971 | 62.8199 | 35.0056 | 128.272 | 387.8816 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1898.4235 | -77.3938 | 6.35 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1898.4235 | 38.7786 | 5.82 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1940.9005 | -27.8729 | 5.78 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1940.9005 | 62.8199 | 6.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.612 | 202] 1.5 [DL + RSX] | 2068.8303 | 100.6086 | -64.3343 |
| Bottom | 0.61 | 202] 1.5 [DL + RSX] | 2111.3073 | -99.8555 | 41.8713 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1761.2597 | 45.1156 | 33.5026 | 132.7324 | 392.342 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1803.7367 | 64.6621 | 33.9901 | 133.6549 | 393.2645 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2142.3871 | -75.2575 | 7 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2142.3871 | 45.1156 | 6.58 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2184.8641 | -31.2142 | 6.51 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2184.8641 | 64.6621 | 6.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.655 | 202] 1.5 [DL + RSX] | 2325.3589 | 100.5705 | -67.2265 |
| Bottom | 0.654 | 202] 1.5 [DL + RSX] | 2367.8359 | -99.7127 | 43.8482 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1982.597 | 45.6326 | 34.2192 | 133.6549 | 393.2645 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2025.0741 | 66.098 | 34.7613 | 133.6549 | 393.2645 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2386.0091 | -77.2314 | 7.71 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2386.0091 | 45.6326 | 7.27 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2428.4862 | -32.6624 | 7.21 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2428.4862 | 66.098 | 7.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.7 | 202] 1.5 [DL + RSX] | 2583.2735 | 100.3584 | -68.912 |
| Bottom | 0.699 | 202] 1.5 [DL + RSX] | 2625.7505 | -99.5185 | 46.3428 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2202.7479 | 46.1189 | 34.8048 | 133.6549 | 393.2645 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2245.2249 | 67.3773 | 35.3625 | 133.6549 | 393.2645 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2629.3815 | -77.7889 | 8.39 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2629.3815 | 46.1189 | 7.95 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2671.8585 | -33.9539 | 7.9 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2671.8585 | 67.3773 | 8.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.705 | 202] 1.5 [DL + RSX] | 2842.1427 | 100.12 | -70.1543 |
| Bottom | 0.704 | 202] 1.5 [DL + RSX] | 2884.6198 | -99.2991 | 48.6581 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2421.526 | 45.9112 | 35.3507 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2464.003 | 69.0091 | 35.8785 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2872.6842 | -77.6386 | 9.07 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2872.6842 | 45.9112 | 8.63 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2915.1613 | -35.7944 | 8.6 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2915.1613 | 69.0091 | 9.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.747 | 202] 1.5 [DL + RSX] | 3101.7238 | 99.7793 | -70.7257 |
| Bottom | 0.747 | 202] 1.5 [DL + RSX] | 3144.2009 | -99.0183 | 51.0613 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2638.6859 | 45.1457 | 35.6922 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2681.163 | 70.8433 | 36.1548 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3116.1407 | -77.13 | 9.74 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3116.1407 | 45.1457 | 9.29 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3158.6177 | -38.3569 | 9.31 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3158.6177 | 70.8433 | 9.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.81 | 202] 1.5 [DL + RSX] | 3361.8351 | 99.2618 | -70.365 |
| Bottom | 0.815 | 202] 1.5 [DL + RSX] | 3404.3121 | -98.6132 | 53.5908 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2853.969 | 44.1441 | 35.5224 | 150.556 | 410.1656 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2896.446 | 71.5661 | 35.9023 | 150.556 | 410.1656 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3361.8351 | -70.365 | 10.33 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3361.8351 | 37.5311 | 9.87 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3404.3121 | -24.2444 | 9.8 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3404.3121 | 53.5908 | 10.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.858 | 202] 1.5 [DL + RSX] | 3622.301 | 98.4945 | -69.7453 |
| Bottom | 0.864 | 202] 1.5 [DL + RSX] | 3664.778 | -97.7453 | 67.1643 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3067.1258 | 42.4522 | 38.7326 | 150.556 | 410.1656 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3109.6029 | 81.7508 | 39.0305 | 150.556 | 410.1656 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3622.301 | -69.7453 | 11.04 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3622.301 | 33.2853 | 10.53 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3664.778 | -21.9882 | 10.49 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3664.778 | 67.1643 | 11.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.882 | 202] 1.5 [DL + RSX] | 3882.7585 | 98.1717 | -57.2244 |
| Bottom | 0.895 | 202] 1.5 [DL + RSX] | 3925.2356 | -96.9255 | 107.2561 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3277.8526 | 51.7475 | 48.0058 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3320.3296 | 119.7959 | 48.2291 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3882.7585 | -57.2244 | 11.59 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3882.7585 | 37.1455 | 11.31 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3925.2356 | -6.348 | 11 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3925.2356 | 107.2561 | 12.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.93 | 202] 1.5 [DL + RSX] | 4140.4902 | 98.1294 | 60.4544 |
| Bottom | 0.988 | 202] 1.5 [DL + RSX] | 4182.9672 | -102.0956 | -292.4574 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3484.0394 | 80.4961 | -104.4006 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3526.5165 | -166.0663 | -104.4909 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4140.4902 | -14.8784 | 11.72 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4140.4902 | 60.4544 | 12.35 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4182.9672 | -292.4574 | 15.7 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.931 | 202] 1.5 [DL + RSX] | 4426.9235 | 160.1914 | 760.5239 |
| Bottom | 0.811 | 202] 1.5 [DL + RSX] | 4487.1849 | -151.8689 | 140.1173 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3631.7834 | 760.5239 | -227.7734 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3692.0448 | 140.1173 | -227.8925 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4426.9235 | 760.5239 | 13.93 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4487.1849 | -33.7314 | 9.03 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4487.1849 | 140.1173 | 9.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.826 | 202] 1.5 [DL + RSX] | 4729.385 | 148.739 | 76.1693 |
| Bottom | 0.838 | 202] 1.5 [DL + RSX] | 4789.6464 | -149.8293 | -100.3451 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3926.3755 | 117.3072 | -49.8034 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3986.6369 | 106.0678 | -50.2144 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4729.385 | -23.2122 | 9.43 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4729.385 | 76.1693 | 9.79 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4789.6464 | -100.3451 | 10.08 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4789.6464 | 53.8082 | 9.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.866 | 202] 1.5 [DL + RSX] | 5031.9506 | 145.3415 | -108.578 |
| Bottom | 0.873 | 202] 1.5 [DL + RSX] | 5092.212 | -146.7921 | 85.559 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4147.383 | 45.9973 | 58.0347 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4207.6444 | 146.9276 | 58.6772 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5031.9506 | -108.578 | 10.61 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5031.9506 | 3.9295 | 9.89 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5092.212 | -59.3298 | 10.39 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5092.212 | 85.559 | 10.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.898 | 202] 1.5 [DL + RSX] | 5334.2566 | 141.589 | -75.9116 |
| Bottom | 0.91 | 202] 1.5 [DL + RSX] | 5394.518 | -143.2545 | 93.8073 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4366.7949 | 76.3267 | 51.2285 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4427.0563 | 161.385 | 52.0474 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5334.2566 | -75.9116 | 10.98 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5334.2566 | 37.0758 | 10.71 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5394.518 | -50.8309 | 10.92 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5394.518 | 93.8073 | 11.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.932 | 202] 1.5 [DL + RSX] | 5635.4238 | 137.6203 | -65.3746 |
| Bottom | 0.947 | 202] 1.5 [DL + RSX] | 5695.6852 | -139.6774 | 97.3921 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4584.2821 | 75.4825 | 48.7401 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4644.5435 | 168.3246 | 49.6582 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5635.4238 | -65.3746 | 11.5 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5635.4238 | 40.1131 | 11.32 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5695.6852 | -57.459 | 11.56 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5695.6852 | 97.3921 | 11.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.966 | 202] 1.5 [DL + RSX] | 5935.0544 | 132.6609 | -61.1218 |
| Bottom | 0.983 | 202] 1.5 [DL + RSX] | 5995.3158 | -135.3421 | 107.352 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4800.2907 | 64.0145 | 49.0849 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4860.5521 | 179.1816 | 50.0195 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5935.0544 | -61.1218 | 12.05 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5935.0544 | 29.6025 | 11.84 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5995.3158 | -69.3865 | 12.23 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5995.3158 | 107.352 | 12.49 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.997 | 202] 1.5 [DL + RSX] | 6232.6246 | 126.921 | -54.3935 |
| Bottom | 1.02 | 202] 1.5 [DL + RSX] | 6292.8859 | -130.5954 | 126.3737 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5015.4878 | 57.1963 | 49.8806 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5075.7492 | 197.0133 | 50.7485 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6232.6246 | -54.3935 | 12.59 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6232.6246 | 16.8068 | 12.33 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6292.8859 | -85.0073 | 12.92 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6292.8859 | 126.3737 | 13.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.027 | 202] 1.5 [DL + RSX] | 6527.3712 | 119.4903 | -51.2839 |
| Bottom | 1.053 | 202] 1.5 [DL + RSX] | 6587.6326 | -122.5931 | 146.4849 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5230.7158 | 64.0033 | 47.8974 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5290.9772 | 214.492 | 48.6239 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6527.3712 | -51.2839 | 13.15 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6527.3712 | 12.3627 | 12.88 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6587.6326 | -117.286 | 13.72 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6587.6326 | 146.4849 | 13.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.065 | 202] 1.5 [DL + RSX] | 6818.2947 | 114.4364 | -78.834 |
| Bottom | 1.114 | 202] 1.5 [DL + RSX] | 6880.4692 | -132.4887 | -256.5489 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5446.7511 | 78.9705 | -56.3428 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5508.9256 | 196.5355 | -56.8589 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6818.2947 | -78.834 | 13.91 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6818.2947 | 22.2745 | 13.52 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6625.7111 | -326.9888 | 15.24 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6880.4692 | 126.0956 | 14.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.352 | 202] 1.5 [DL + RSX] | 7286.8263 | 267.7304 | 223.0958 |
| Bottom | 1.397 | 202] 1.5 [DL + RSX] | 7367.1749 | -270.0926 | -426.2384 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5571.011 | 223.0958 | -117.5771 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5651.3596 | 176.1501 | -117.6306 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 4432.337 | -42.3398 | 8.98 | 6 |
| Top–Right | Leg 1 | 600 | 207] [0.9 DL + 1.5 RSY] | 7286.8263 | 223.0958 | 15.82 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7367.1749 | -426.2384 | 17.38 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7367.1749 | 176.1501 | 15.65 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.393 | 202] 1.5 [DL + RSX] | 7750.8312 | 249.1261 | 320.4815 |
| Bottom | 1.431 | 202] 1.5 [DL + RSX] | 7827.7363 | 251.1974 | -490.5989 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5973.0878 | 320.4815 | -92.7774 | 198.4094 | 566.7129 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6049.9928 | 398.6337 | -92.7863 | 198.4094 | 566.7129 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7750.8312 | -111.241 | 15.96 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7750.8312 | 320.4815 | 17.4 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7827.7363 | -490.5989 | 18.73 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7827.7363 | 398.6337 | 18.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.132 | 202] 1.5 [DL + RSX] | 1624.8011 | 269.0462 | -835.6247 |
| Bottom | 1.5 | 206] [0.9 DL + 1.5 RSX] | 906.8558 | -198.2454 | 202.0567 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1774.8401 | -554.077 | 424.8228 | 152.5363 | 498.9711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1831.5234 | 380.7468 | 425.3191 | 153.8513 | 500.2861 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2134.9754 | -696.6262 | 9.89 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1266.9911 | -17.6917 | 2.78 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2191.6587 | 292.8205 | 6.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.27 | 206] [0.9 DL + 1.5 RSX] | 963.5888 | 186.2506 | -157.4 |
| Bottom | 1.261 | 206] [0.9 DL + 1.5 RSX] | 997.5987 | -187.1985 | 172.2755 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1955.7886 | 51.6708 | 187.3599 | 156.7343 | 503.1691 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2012.4718 | 331.3704 | 187.9565 | 158.0493 | 504.4841 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2357.6035 | -207.0412 | 6.53 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2195.7017 | 51.6708 | 4.98 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1399.4136 | -48.6077 | 3.3 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2414.2867 | 242.9661 | 6.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.961 | 206] [0.9 DL + 1.5 RSX] | 1055.1386 | 190.4166 | -179.7246 |
| Bottom | 0.917 | 206] [0.9 DL + 1.5 RSX] | 1089.1486 | -188.8871 | 167.1926 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2139.6762 | 23.9746 | 199.1549 | 185.2246 | 531.6594 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2196.3594 | 328.7358 | 199.708 | 186.7375 | 533.1723 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2583.7719 | -243.817 | 7.29 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2408.962 | 23.9746 | 5.21 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1533.2443 | -58.5343 | 3.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2640.4552 | 234.743 | 7.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.899 | 202] 1.5 [DL + RSX] | 2813.2092 | 234.6288 | -247.3856 |
| Bottom | 0.892 | 202] 1.5 [DL + RSX] | 2869.8924 | -232.875 | 231.7921 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2326.5964 | 26.112 | 199.4754 | 190.2136 | 536.6484 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2383.2797 | 328.9596 | 200.0356 | 191.7265 | 538.1613 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2813.2092 | -75.5518 | 6.45 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2624.4198 | 26.112 | 5.67 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1668.2265 | -64.4845 | 3.98 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2869.8924 | 231.7921 | 7.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.936 | 206] [0.9 DL + 1.5 RSX] | 1241.2133 | 189.2229 | -182.3415 |
| Bottom | 0.925 | 202] 1.5 [DL + RSX] | 3103.3886 | -230.5566 | 229.4745 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2517.3704 | 31.4574 | 198.3535 | 175.1616 | 521.5964 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2574.0537 | 328.0851 | 198.9338 | 175.1616 | 521.5964 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3046.7054 | -71.1687 | 6.9 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2842.5279 | 31.4574 | 6.17 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2899.2111 | -4.9951 | 6.08 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3103.3886 | 229.4745 | 8.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 202] 1.5 [DL + RSX] | 3285.0944 | 229.8756 | -243.4095 |
| Bottom | 0.928 | 202] 1.5 [DL + RSX] | 3341.7776 | -227.9371 | 227.2922 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2712.8144 | 35.7284 | 197.2495 | 175.1616 | 521.5964 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2769.4977 | 327.0976 | 197.8392 | 175.1616 | 521.5964 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3285.0944 | -67.2351 | 7.37 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3063.6967 | 35.7284 | 6.66 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3120.3799 | -11.6782 | 6.59 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3341.7776 | 227.2922 | 8.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.923 | 202] 1.5 [DL + RSX] | 3529.1657 | 226.9161 | -240.4287 |
| Bottom | 0.92 | 202] 1.5 [DL + RSX] | 3585.8489 | -224.9365 | 225.0056 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2913.748 | 38.7324 | 195.9756 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2970.4313 | 326.6262 | 196.5493 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3529.1657 | -63.4695 | 7.85 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3288.2962 | 38.7324 | 7.15 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3344.9795 | -19.0616 | 7.12 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3585.8489 | 225.0056 | 9.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.938 | 202] 1.5 [DL + RSX] | 3779.6661 | 223.3793 | -236.4739 |
| Bottom | 0.935 | 202] 1.5 [DL + RSX] | 3836.3494 | -221.3844 | 222.7684 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3121.0338 | 40.476 | 194.3255 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3177.7171 | 326.8813 | 194.8559 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3779.6661 | -60.0711 | 8.34 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3516.6789 | 40.476 | 7.64 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3573.3622 | -27.377 | 7.66 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3836.3494 | 222.7684 | 9.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.952 | 202] 1.5 [DL + RSX] | 4037.2884 | 219.1427 | -231.096 |
| Bottom | 0.95 | 202] 1.5 [DL + RSX] | 4093.9717 | -217.1669 | 221.2317 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3335.5839 | 41.2989 | 192.1931 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3392.2671 | 327.8911 | 192.6622 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4037.2884 | -57.3641 | 8.86 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3749.1818 | 41.2989 | 8.13 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3805.865 | -36.2956 | 8.21 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4093.9717 | 221.2317 | 10.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.964 | 202] 1.5 [DL + RSX] | 4302.6615 | 213.9797 | -223.5163 |
| Bottom | 0.964 | 202] 1.5 [DL + RSX] | 4359.3447 | -212.0357 | 220.452 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3558.3598 | 41.8923 | 189.0555 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3615.043 | 328.2279 | 189.4618 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4302.6615 | -55.5413 | 9.4 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3986.1321 | 41.8923 | 8.63 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4042.8154 | -45.3376 | 8.78 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4359.3447 | 220.452 | 10.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.978 | 202] 1.5 [DL + RSX] | 4576.5717 | 207.8765 | -213.5586 |
| Bottom | 0.98 | 202] 1.5 [DL + RSX] | 4633.255 | -206.5863 | 192.0761 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3790.5348 | 42.9113 | 177.3062 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3847.2181 | 302.3397 | 177.6622 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4576.5717 | -55.3936 | 9.97 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4228.06 | 42.9113 | 9.14 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4284.7433 | -97.4802 | 9.69 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4633.255 | 12.7834 | 9.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1 | 202] 1.5 [DL + RSX] | 4858.1135 | 197.6312 | -233.6183 |
| Bottom | 1.035 | 202] 1.5 [DL + RSX] | 4914.7967 | -193.3309 | 449.5446 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4032.1144 | -3.0356 | 263.0297 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4088.7977 | 567.5576 | 263.2161 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4858.1135 | -102.4259 | 10.92 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2772.7258 | 64.1733 | 6.28 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4914.7967 | 449.5446 | 13.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.98 | 202] 1.5 [DL + RSX] | 5190.721 | 230.806 | -1295.4137 |
| Bottom | 0.826 | 202] 1.5 [DL + RSX] | 5268.6605 | -221.8283 | 318.8758 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4284.8555 | -937.9414 | 601.52 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4362.795 | 547.3248 | 601.7505 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5190.721 | -1097.701 | 12.4 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4852.3525 | -159.6725 | 8.01 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5268.6605 | 318.8758 | 9.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.822 | 202] 1.5 [DL + RSX] | 5524.2042 | 205.115 | -266.1907 |
| Bottom | 0.839 | 202] 1.5 [DL + RSX] | 5602.1437 | -208.0176 | 314.0262 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4517.4116 | 85.3132 | 263.8687 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4595.3511 | 563.491 | 264.4553 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5524.2042 | -74.2555 | 8.68 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5087.1027 | 85.3132 | 8.06 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5165.0422 | -166.1239 | 8.51 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5602.1437 | 314.0262 | 9.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 202] 1.5 [DL + RSX] | 5859.2361 | 202.1296 | -242.0219 |
| Bottom | 0.86 | 202] 1.5 [DL + RSX] | 5937.1755 | -202.8797 | 280.7489 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4753.8115 | 105.6251 | 245.4479 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4831.751 | 542.603 | 246.228 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5859.2361 | -50.1382 | 9.08 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5399.5594 | 105.6251 | 8.62 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5477.4989 | -200.0049 | 9.13 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5937.1755 | 280.7489 | 10.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.868 | 202] 1.5 [DL + RSX] | 6195.473 | 193.1725 | -249.7685 |
| Bottom | 0.879 | 202] 1.5 [DL + RSX] | 6273.4125 | -194.7441 | 267.5004 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4994.8685 | 78.9804 | 243.5807 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5072.808 | 541.8874 | 244.5046 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6195.473 | -61.9807 | 9.64 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5711.1748 | 78.9804 | 8.98 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5789.1143 | -219.178 | 9.68 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6273.4125 | 267.5004 | 10.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.888 | 202] 1.5 [DL + RSX] | 6532.9395 | 183.0585 | -237.3728 |
| Bottom | 0.899 | 202] 1.5 [DL + RSX] | 6610.879 | -185.1241 | 259.5326 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5241.4167 | 59.7846 | 236.0953 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5319.3562 | 548.814 | 237.1083 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6532.9395 | -59.1742 | 10.14 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6022.0119 | 59.7846 | 9.37 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6099.9514 | -243.0701 | 10.25 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6610.879 | 259.5326 | 11.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 202] 1.5 [DL + RSX] | 6871.7287 | 170.9618 | -217.7209 |
| Bottom | 0.925 | 202] 1.5 [DL + RSX] | 6949.6682 | -173.7014 | 254.4345 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5494.3704 | 36.3669 | 226.38 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5572.3099 | 563.5001 | 227.4071 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6871.7287 | -58.2062 | 10.65 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6332.4678 | 36.3669 | 9.74 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6410.4073 | -276.9372 | 10.86 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6949.6682 | 32.1284 | 10.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.933 | 202] 1.5 [DL + RSX] | 7211.7015 | 156.455 | -192.9259 |
| Bottom | 0.948 | 202] 1.5 [DL + RSX] | 7289.641 | -159.9845 | 253.2861 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5754.6008 | 16.2813 | 214.7161 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5832.5403 | 588.353 | 215.669 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7211.7015 | -61.7542 | 11.18 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6642.9471 | 16.2813 | 10.13 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6720.8865 | -324.1708 | 11.52 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7289.641 | 253.2861 | 12.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.951 | 202] 1.5 [DL + RSX] | 7552.1713 | 139.1068 | -163.738 |
| Bottom | 0.971 | 202] 1.5 [DL + RSX] | 7630.1108 | -144.1226 | 260.3983 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6022.828 | 27.7507 | 200.5783 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6100.7675 | 625.3862 | 201.3754 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7552.1713 | -69.7162 | 11.73 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6953.6811 | 27.7507 | 10.65 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7630.1108 | -18.4796 | 11.64 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7630.1108 | 260.3983 | 12.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.965 | 202] 1.5 [DL + RSX] | 7893.191 | 116.5493 | -144.5103 |
| Bottom | 0.993 | 202] 1.5 [DL + RSX] | 7973.6048 | -125.5571 | 273.685 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6299.9707 | 96.5236 | 176.4289 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6380.3844 | 669.347 | 177.0345 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7893.191 | -66.4894 | 12.23 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7265.8082 | 96.5236 | 11.41 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7973.6048 | -49.9938 | 12.29 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7973.6048 | 273.685 | 13.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.182 | 202] 1.5 [DL + RSX] | 8227.6438 | 313.647 | -147.1099 |
| Bottom | 1.221 | 202] 1.5 [DL + RSX] | 8331.5632 | 316.7022 | 377.9137 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6582.8594 | 221.7463 | 145.2937 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6686.7787 | 843.4528 | 145.7088 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8227.6438 | -15.8171 | 12.53 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7576.5936 | 221.7463 | 12.4 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8331.5632 | -94.7779 | 13.02 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8331.5632 | 377.9137 | 14.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.179 | 202] 1.5 [DL + RSX] | 8599.015 | 275.132 | -269.5444 |
| Bottom | 1.2 | 202] 1.5 [DL + RSX] | 8698.4807 | 277.811 | 347.6878 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6927.2237 | 423.2454 | 138.4806 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7026.6893 | 982.3291 | 138.555 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8599.015 | -269.5444 | 14.14 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8599.015 | 69.0507 | 13.31 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8036.1824 | -972.6251 | 16.2 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8036.1824 | 982.3291 | 16.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.217 | 202] 1.5 [DL + RSX] | 1260.1525 | -256.9978 | -708.5469 |
| Bottom | 1.72 | 206] [0.9 DL + 1.5 RSX] | 681.5035 | 190.2752 | 190.7529 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1394.7057 | -476.0534 | 360.5526 | 143.7172 | 490.152 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1451.3889 | 336.9392 | 361.004 | 145.0322 | 491.467 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1803.1421 | -587.255 | 8.34 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1089.94 | -15.9924 | 2.4 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1725.2722 | 336.9392 | 6.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.42 | 206] [0.9 DL + 1.5 RSX] | 750.5795 | -177.2612 | -161.3358 |
| Bottom | 1.394 | 206] [0.9 DL + 1.5 RSX] | 784.5895 | 178.69 | 169.9359 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1591.31 | 36.5781 | 173.653 | 148.2784 | 494.7132 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1647.9932 | 303.2915 | 174.2402 | 149.5934 | 496.0282 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1890.0099 | -287.1219 | 6.18 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1890.0099 | 36.5781 | 4.22 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1227.7559 | -40.4346 | 2.87 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2091.1596 | 235.6501 | 6.2 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.032 | 206] [0.9 DL + 1.5 RSX] | 853.5486 | -182.1567 | -176.6397 |
| Bottom | 0.99 | 206] [0.9 DL + 1.5 RSX] | 887.5586 | 180.7543 | 166.095 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1789.4124 | 18.9176 | 181.6814 | 175.8758 | 522.3106 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1846.0956 | 301.6965 | 182.231 | 177.3887 | 523.8235 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2269.2313 | -236.7675 | 6.58 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2114.0625 | 18.9176 | 4.55 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1367.3775 | -49.7768 | 3.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2325.9146 | 229.075 | 6.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.954 | 206] [0.9 DL + 1.5 RSX] | 956.676 | -181.2633 | -178.9279 |
| Bottom | 0.913 | 206] [0.9 DL + 1.5 RSX] | 990.6859 | 180.3392 | 164.9395 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1989.4349 | 21.1162 | 181.7028 | 181.2145 | 527.6493 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2046.1182 | 301.8771 | 182.2647 | 182.7275 | 529.1622 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2507.2371 | -239.3861 | 7.09 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2340.4563 | 21.1162 | 5.04 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1508.488 | -55.1173 | 3.57 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2563.9203 | 226.6294 | 7.11 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.992 | 206] [0.9 DL + 1.5 RSX] | 1060.148 | -181.0932 | -178.1332 |
| Bottom | 0.945 | 206] [0.9 DL + 1.5 RSX] | 1094.1579 | 180.078 | 164.2641 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2191.9991 | 26.0318 | 180.4235 | 170.1014 | 516.5361 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2248.6824 | 300.7577 | 181.0073 | 171.4803 | 517.9151 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2748.8723 | -58.7677 | 6.19 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2569.2762 | 26.0318 | 5.56 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1651.0311 | -59.6505 | 3.91 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2805.5556 | 224.5409 | 7.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.905 | 206] [0.9 DL + 1.5 RSX] | 1164.1647 | -180.6371 | -176.7677 |
| Bottom | 0.882 | 202] 1.5 [DL + RSX] | 3051.2955 | 217.8223 | 222.3531 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2397.786 | 29.6163 | 179.1012 | 175.1077 | 521.5425 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2454.4693 | 299.4347 | 179.6918 | 175.1616 | 521.5964 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2994.6122 | -55.0468 | 6.67 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2800.6852 | 29.6163 | 6.07 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2857.3684 | -5.6003 | 6 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3051.2955 | 222.3531 | 8.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.87 | 202] 1.5 [DL + RSX] | 3244.9051 | -216.7899 | -231.4829 |
| Bottom | 0.869 | 202] 1.5 [DL + RSX] | 3301.5883 | 215.2263 | 219.8645 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2607.4768 | 31.7823 | 177.5571 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2664.16 | 298.6572 | 178.1257 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3244.9051 | -51.5053 | 7.16 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3034.8457 | 31.7823 | 6.57 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3091.529 | -12.8234 | 6.54 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3301.5883 | 219.8645 | 8.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.886 | 202] 1.5 [DL + RSX] | 3500.1727 | -213.6128 | -227.357 |
| Bottom | 0.885 | 202] 1.5 [DL + RSX] | 3556.8559 | 212.0475 | 217.2055 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2821.7894 | 32.736 | 175.5874 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2878.4726 | 298.6524 | 176.1049 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3500.1727 | -48.3131 | 7.67 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3271.9207 | 32.736 | 7.07 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3328.604 | -21.2752 | 7.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3556.8559 | 217.2055 | 9.11 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.901 | 202] 1.5 [DL + RSX] | 3760.8001 | -209.7126 | -221.953 |
| Bottom | 0.901 | 202] 1.5 [DL + RSX] | 3817.4833 | 208.1849 | 215.0569 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3041.487 | 32.9807 | 173.1323 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3098.1703 | 299.4622 | 173.5823 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3760.8001 | -45.7579 | 8.19 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3512.065 | 32.9807 | 7.57 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3568.7483 | -30.3953 | 7.67 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3817.4833 | 215.0569 | 9.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.914 | 202] 1.5 [DL + RSX] | 4027.1316 | -204.8847 | -214.5093 |
| Bottom | 0.916 | 202] 1.5 [DL + RSX] | 4083.8148 | 203.4154 | 213.3412 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3267.3814 | 33.4407 | 169.6175 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3324.0646 | 299.4034 | 170.0027 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4027.1316 | -43.7997 | 8.73 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3755.4272 | 33.4407 | 8.09 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3812.1104 | -39.744 | 8.25 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4083.8148 | 213.3412 | 10.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.927 | 202] 1.5 [DL + RSX] | 4299.6175 | -199.1452 | -205.1017 |
| Bottom | 0.929 | 202] 1.5 [DL + RSX] | 4356.3007 | 198.3712 | 185.1056 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3500.4417 | 34.6303 | 157.7347 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3557.125 | 273.4695 | 158.0705 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4299.6175 | -43.2155 | 9.3 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4002.2889 | 34.6303 | 8.61 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4356.3007 | -3.3762 | 9.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4356.3007 | 185.1056 | 10.52 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.948 | 202] 1.5 [DL + RSX] | 4576.9694 | -189.4602 | -224.499 |
| Bottom | 0.983 | 202] 1.5 [DL + RSX] | 4633.6526 | 185.8999 | 418.8189 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3740.4552 | -9.3132 | 238.7005 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3797.1384 | 525.9907 | 238.855 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4576.9694 | -88.9762 | 10.23 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2652.907 | 53.3818 | 5.94 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4633.6526 | 418.8189 | 12.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.936 | 202] 1.5 [DL + RSX] | 4903.9164 | -224.6685 | -1210.5365 |
| Bottom | 0.791 | 202] 1.5 [DL + RSX] | 4981.8558 | 215.9824 | 313.9781 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3989.8825 | -885.7022 | 558.8721 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4067.8219 | 518.2887 | 559.0911 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4903.9164 | -1037.8277 | 11.72 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4633.2246 | -156.1525 | 7.67 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4981.8558 | 313.9781 | 8.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.785 | 202] 1.5 [DL + RSX] | 5233.0425 | -198.7642 | -253.475 |
| Bottom | 0.803 | 202] 1.5 [DL + RSX] | 5310.982 | 202.0466 | 310.1122 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4219.1498 | 90.3852 | 240.7448 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4297.0892 | 533.7245 | 241.3315 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5233.0425 | -51.4103 | 8.14 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4871.891 | 90.3852 | 7.76 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4949.8305 | -162.177 | 8.17 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5310.982 | 310.1122 | 9.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.81 | 202] 1.5 [DL + RSX] | 5562.4575 | -195.8578 | -229.1475 |
| Bottom | 0.824 | 202] 1.5 [DL + RSX] | 5640.3969 | 196.8979 | 276.903 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4450.7923 | 110.8404 | 222.6843 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4528.7317 | 511.34 | 223.4789 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5562.4575 | -29.849 | 8.55 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5188.3813 | 110.8404 | 8.32 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5266.3208 | -195.9247 | 8.79 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5640.3969 | 276.903 | 9.69 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.829 | 202] 1.5 [DL + RSX] | 5891.9384 | -186.7365 | -237.5332 |
| Bottom | 0.842 | 202] 1.5 [DL + RSX] | 5969.8779 | 188.6877 | 263.6522 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4685.7676 | 83.1068 | 221.7237 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4763.7071 | 510.038 | 222.6675 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5891.9384 | -44.8298 | 9.11 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5504.1354 | 83.1068 | 8.68 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5582.0749 | -213.9274 | 9.34 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5969.8779 | 263.6522 | 10.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.848 | 202] 1.5 [DL + RSX] | 6221.3175 | -176.6171 | -225.2179 |
| Bottom | 0.86 | 202] 1.5 [DL + RSX] | 6299.2569 | 179.0912 | 255.2093 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4924.8043 | 64.5251 | 214.9811 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5002.7438 | 516.8617 | 216.0136 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6221.3175 | -43.4375 | 9.61 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5818.9007 | 64.5251 | 9.08 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5896.8402 | -237.0462 | 9.91 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6299.2569 | 255.2093 | 10.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.87 | 202] 1.5 [DL + RSX] | 6550.5826 | -164.5691 | -205.781 |
| Bottom | 0.884 | 202] 1.5 [DL + RSX] | 6628.5221 | 167.7578 | 249.0071 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5168.8128 | 43.4693 | 206.1061 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5246.7523 | 531.9499 | 207.1489 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6550.5826 | -43.535 | 10.11 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6132.7998 | 43.4693 | 9.47 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6210.7393 | -270.9307 | 10.53 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6210.7393 | 531.9499 | 11.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.891 | 202] 1.5 [DL + RSX] | 6879.5207 | -150.2198 | -181.8012 |
| Bottom | 0.907 | 202] 1.5 [DL + RSX] | 6957.4602 | 154.2785 | 245.8302 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5418.7145 | 28.9436 | 195.3349 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5496.654 | 557.2808 | 196.2984 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6879.5207 | -47.7851 | 10.62 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6445.9336 | 28.9436 | 9.89 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6957.4602 | -7.6472 | 10.57 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6523.8731 | 557.2808 | 12.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.908 | 202] 1.5 [DL + RSX] | 7207.4324 | -133.1064 | -155.3001 |
| Bottom | 0.928 | 202] 1.5 [DL + RSX] | 7285.3719 | 138.7419 | 249.3718 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5675.3365 | 47.5929 | 182.1669 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5753.276 | 594.1467 | 182.9701 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7207.4324 | -55.4365 | 11.15 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6758.1599 | 47.5929 | 10.44 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7285.3719 | -35.1061 | 11.18 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7285.3719 | 249.3718 | 12.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.921 | 202] 1.5 [DL + RSX] | 7534.413 | -111.0726 | -141.0261 |
| Bottom | 0.949 | 202] 1.5 [DL + RSX] | 7614.8267 | 120.6077 | 257.954 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5939.877 | 116.5048 | 159.9071 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6020.2908 | 636.9489 | 160.5153 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7534.413 | -51.311 | 11.63 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7070.2643 | 116.5048 | 11.19 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7614.8267 | -68.3916 | 11.82 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7614.8267 | 257.954 | 12.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.134 | 202] 1.5 [DL + RSX] | 7855.4365 | 302.9413 | -147.6688 |
| Bottom | 1.177 | 202] 1.5 [DL + RSX] | 7959.3558 | 305.9965 | 420.5503 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6210.6772 | 234.904 | 151.7732 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6314.5965 | 883.5997 | 152.1847 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7855.4365 | -5.3035 | 11.92 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7379.8776 | 234.904 | 12.15 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7959.3558 | -60.6835 | 12.31 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7959.3558 | 420.5503 | 13.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.143 | 202] 1.5 [DL + RSX] | 8279.2144 | 266.1376 | -315.4568 |
| Bottom | 1.162 | 202] 1.5 [DL + RSX] | 8378.6801 | 268.8166 | 369.5992 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6609.3608 | 385.6964 | 152.5866 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6708.8265 | 1001.5226 | 152.66 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8279.2144 | -315.4568 | 13.85 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8279.2144 | 30.4917 | 12.67 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7890.3506 | -971.1938 | 15.97 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7890.3506 | 1001.5226 | 16.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.636 | 203] 1.5 [DL + RSY] | 1843.4796 | -287.5591 | 216.7252 |
| Bottom | 0.469 | 203] 1.5 [DL + RSY] | 2109.5171 | 250.4719 | 46.1044 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1828.1308 | 325.4306 | -118.6657 | 191.3566 | 654.7132 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1903.9447 | 130.3977 | -118.812 | 193.1155 | 656.472 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 1273.6155 | -14.0313 | 2.07 | 6 |
| Top–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 2049.0521 | 325.4306 | 5.09 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2124.866 | -90.0393 | 3.83 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2124.866 | 130.3977 | 4.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.439 | 203] 1.5 [DL + RSY] | 2342.0142 | -223.3677 | 65.797 |
| Bottom | 0.446 | 203] 1.5 [DL + RSY] | 2417.8281 | 228.439 | -42.7098 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2107.2347 | 180.6694 | -69.5211 | 197.8318 | 661.1884 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2183.0485 | 110.4758 | -70.1288 | 199.5907 | 662.9472 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2429.3496 | -107.9282 | 4.41 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2429.3496 | 180.6694 | 4.84 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2505.1634 | -145.9154 | 4.75 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2505.1634 | 110.4758 | 4.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.467 | 203] 1.5 [DL + RSY] | 2652.536 | -234.232 | -28.8265 |
| Bottom | 0.468 | 203] 1.5 [DL + RSY] | 2728.3498 | 230.0362 | -36.8678 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2383.51 | 157.3651 | -55.4352 | 204.2414 | 667.598 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2459.3239 | 120.0345 | -56.1656 | 206.0003 | 669.3568 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2808.278 | -159.3321 | 5.3 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2808.278 | 157.3651 | 5.29 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2884.0918 | -145.2569 | 5.34 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2884.0918 | 120.0345 | 5.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.482 | 203] 1.5 [DL + RSY] | 2964.7477 | -229.0361 | 29.99 |
| Bottom | 0.485 | 203] 1.5 [DL + RSY] | 3040.5616 | 226.762 | -32.8361 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2657.555 | 163.6545 | -55.0003 | 210.5993 | 673.9558 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2733.3689 | 125.3483 | -55.6856 | 212.3582 | 675.7147 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3184.006 | -157.5945 | 5.88 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3184.006 | 163.6545 | 5.91 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3259.8199 | -144.3201 | 5.92 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3259.8199 | 125.3483 | 5.81 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.501 | 203] 1.5 [DL + RSY] | 3280.3077 | -227.1959 | 32.1312 |
| Bottom | 0.506 | 203] 1.5 [DL + RSY] | 3356.1216 | 224.5909 | -32.2112 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2930.0722 | 166.6506 | -55.2669 | 216.9217 | 680.2782 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3005.8861 | 127.6514 | -55.8797 | 218.6806 | 682.0371 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3556.2398 | -154.9102 | 6.44 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3556.2398 | 166.6506 | 6.51 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3632.0537 | -146.726 | 6.51 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3632.0537 | 127.6514 | 6.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.527 | 203] 1.5 [DL + RSY] | 3599.9777 | -224.7758 | 31.4531 |
| Bottom | 0.532 | 203] 1.5 [DL + RSY] | 3675.7915 | 222.3206 | -32.1038 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3201.4497 | 166.2014 | -54.743 | 223.2176 | 686.5742 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3277.2636 | 129.8063 | -55.2937 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3924.8586 | -154.2638 | 7.01 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3924.8586 | 166.2014 | 7.08 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4000.6725 | -149.7586 | 7.1 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4000.6725 | 129.8063 | 6.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.546 | 202] 1.5 [DL + RSX] | 4289.6915 | -170.7685 | 164.8889 |
| Bottom | 0.549 | 203] 1.5 [DL + RSY] | 3997.9989 | 220.0949 | -32.0006 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3471.8933 | 164.8889 | -54.0722 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3547.7072 | 132.0864 | -54.5837 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4289.6915 | -152.9228 | 7.57 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4289.6915 | 164.8889 | 7.64 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4365.5054 | -152.8083 | 7.69 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4365.5054 | 132.0864 | 7.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.577 | 202] 1.5 [DL + RSX] | 4650.546 | -168.8852 | 162.9204 |
| Bottom | 0.58 | 202] 1.5 [DL + RSX] | 4726.3599 | 164.4141 | -155.6664 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3741.5695 | 162.9204 | -53.3935 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3817.3833 | 134.0587 | -53.8946 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4650.546 | -150.2792 | 8.12 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4650.546 | 162.9204 | 8.19 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4726.3599 | -155.6664 | 8.27 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4726.3599 | 134.0587 | 8.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.61 | 202] 1.5 [DL + RSX] | 5007.1827 | -166.3684 | 159.7911 |
| Bottom | 0.615 | 202] 1.5 [DL + RSX] | 5082.9965 | 162.4271 | -160.535 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4010.615 | 159.7911 | -53.4898 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4086.4289 | 133.3681 | -54.0023 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5007.1827 | -146.0823 | 8.65 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5007.1827 | 159.7911 | 8.73 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5082.9965 | -160.535 | 8.85 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5082.9965 | 133.3681 | 8.69 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.643 | 202] 1.5 [DL + RSX] | 5359.292 | -163.1507 | 152.5031 |
| Bottom | 0.65 | 202] 1.5 [DL + RSX] | 5435.1059 | 160.2707 | -177.3797 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4279.1294 | 152.5031 | -56.8377 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4354.9432 | 123.4944 | -57.3601 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5359.292 | -142.1267 | 9.18 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5359.292 | 152.5031 | 9.24 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5435.1059 | -177.3797 | 9.5 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5435.1059 | 123.4944 | 9.18 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.675 | 202] 1.5 [DL + RSX] | 5706.4355 | -158.2351 | -146.1956 |
| Bottom | 0.684 | 202] 1.5 [DL + RSX] | 5782.2493 | 157.3702 | -189.5111 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4547.1102 | 131.3469 | -54.289 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4622.924 | 136.3409 | -54.7565 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5706.4355 | -146.1956 | 9.74 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5706.4355 | 131.3469 | 9.65 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5782.2493 | -189.5111 | 10.11 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5782.2493 | 136.3409 | 9.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.703 | 202] 1.5 [DL + RSX] | 6046.2899 | -149.3164 | -136.7678 |
| Bottom | 0.724 | 202] 1.5 [DL + RSX] | 6122.1037 | 149.704 | 471.9235 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4813.4581 | 122.1983 | 135.5404 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4889.272 | 471.9235 | 135.6009 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6046.2899 | -136.7678 | 10.21 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6046.2899 | 122.1983 | 10.13 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6122.1037 | 471.9235 | 12.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.661 | 202] 1.5 [DL + RSX] | 6400.6063 | -171.2125 | -943.142 |
| Bottom | 0.635 | 202] 1.5 [DL + RSX] | 6495.0784 | 167.3496 | -330.2121 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5084.3796 | -591.815 | 271.8451 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5178.8517 | 228.7849 | 271.6471 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6400.6063 | -591.815 | 10.22 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6495.0784 | -330.2121 | 9.36 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6495.0784 | 228.7849 | 8.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.652 | 202] 1.5 [DL + RSX] | 6770.1728 | -155.672 | -273.6442 |
| Bottom | 0.662 | 202] 1.5 [DL + RSX] | 6864.6449 | 157.8213 | 324.4965 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5348.5151 | 134.6262 | 89.1265 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5442.9872 | 324.4965 | 89.3326 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6770.1728 | -273.6442 | 9.49 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6770.1728 | 134.6262 | 8.97 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6864.6449 | -252.3146 | 9.53 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6864.6449 | 324.4965 | 9.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.682 | 202] 1.5 [DL + RSX] | 7137.7779 | -156.243 | 239.3677 |
| Bottom | 0.692 | 202] 1.5 [DL + RSX] | 7232.25 | 155.3965 | 318.0184 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5615.941 | 239.3677 | -62.7713 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5710.4131 | 318.0184 | -63.0844 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7137.7779 | -195.9489 | 9.66 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7137.7779 | 239.3677 | 9.82 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7232.25 | -294.9576 | 10.15 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7232.25 | 318.0184 | 10.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 202] 1.5 [DL + RSX] | 7503.225 | -151.5197 | 228.3605 |
| Bottom | 0.721 | 202] 1.5 [DL + RSX] | 7597.6971 | 151.0905 | -325.8486 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5886.4107 | 228.3605 | -59.7919 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5980.8828 | 322.9371 | -60.2505 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7503.225 | -222.3791 | 10.21 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7503.225 | 228.3605 | 10.24 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7597.6971 | -325.8486 | 10.72 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7597.6971 | 322.9371 | 10.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.739 | 202] 1.5 [DL + RSX] | 7865.6926 | -147.7651 | -236.6247 |
| Bottom | 0.751 | 202] 1.5 [DL + RSX] | 7960.1647 | 147.4051 | -348.4944 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6159.5486 | 227.2684 | -57.5194 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6254.0207 | 336.2325 | -58.2181 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7865.6926 | -236.6247 | 10.72 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7865.6926 | 227.2684 | 10.68 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7960.1647 | -348.4944 | 11.26 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7960.1647 | 336.2325 | 11.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.767 | 202] 1.5 [DL + RSX] | 8224.8201 | -142.7113 | -242.6589 |
| Bottom | 0.78 | 202] 1.5 [DL + RSX] | 8319.2922 | 143.1956 | -373.5704 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6435.3584 | 234.5551 | -58.3972 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6529.8305 | 353.0523 | -59.3731 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8224.8201 | -242.6589 | 11.19 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8224.8201 | 234.5551 | 11.16 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8319.2922 | -373.5704 | 11.8 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8319.2922 | 353.0523 | 11.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.795 | 202] 1.5 [DL + RSX] | 8580.2452 | -136.4469 | -251.8731 |
| Bottom | 0.809 | 202] 1.5 [DL + RSX] | 8674.7173 | 138.5757 | -402.282 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6713.8686 | 246.5653 | -58.754 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6808.3407 | 380.7947 | -59.9303 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8580.2452 | -251.8731 | 11.67 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8580.2452 | 246.5653 | 11.65 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8674.7173 | -402.282 | 12.35 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8674.7173 | 380.7947 | 12.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.823 | 202] 1.5 [DL + RSX] | 8931.6298 | -127.6879 | 274.2002 |
| Bottom | 0.837 | 202] 1.5 [DL + RSX] | 9026.1019 | 131.0412 | 439.8985 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6995.2199 | 274.2002 | 57.7952 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7089.6921 | 439.8985 | 58.9924 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8931.6298 | -268.7622 | 12.17 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8931.6298 | 274.2002 | 12.19 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9026.1019 | -424.437 | 12.87 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9026.1019 | 439.8985 | 12.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.852 | 202] 1.5 [DL + RSX] | 9279.0172 | -119.0715 | 340.8698 |
| Bottom | 0.873 | 202] 1.5 [DL + RSX] | 9376.4884 | 140.3495 | 552.23 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7279.2843 | 340.8698 | 65.2457 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7376.7556 | 552.23 | 66.2326 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9279.0172 | -284.9813 | 12.67 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9279.0172 | 340.8698 | 12.88 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9376.4884 | -464.5778 | 13.46 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9376.4884 | 552.23 | 13.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.869 | 202] 1.5 [DL + RSX] | 9694.181 | -95.3358 | 222.9893 |
| Bottom | 0.891 | 202] 1.5 [DL + RSX] | 9820.1438 | 5.8732 | 952.9787 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7660.2658 | 222.9893 | 174.6686 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7786.2286 | 952.9787 | 175.4135 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9694.181 | -467.1197 | 13.87 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9694.181 | 222.9893 | 12.95 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9820.1438 | -809.2729 | 15.31 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9820.1438 | 952.9787 | 15.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.9 | 202] 1.5 [DL + RSX] | 10115.1457 | -26.1053 | -833.1373 |
| Bottom | 0.974 | 202] 1.5 [DL + RSX] | 10235.71 | 57.6674 | 1718.0222 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8049.5202 | 691.662 | 254.2206 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8170.0846 | 1718.0222 | 254.354 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 10115.1457 | -833.1373 | 15.77 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 10115.1457 | 691.662 | 15.24 | 6 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10235.71 | -1660.0006 | 19.02 | 6 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10235.71 | 1718.0222 | 19.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.59 | 203] 1.5 [DL + RSY] | 1738.8955 | -270.0295 | -193.1312 |
| Bottom | 0.443 | 203] 1.5 [DL + RSY] | 2003.2817 | 234.2751 | -60.9797 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1740.9672 | -42.8245 | 106.6441 | 189.3344 | 652.691 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1816.781 | 78.2174 | 106.7946 | 191.0933 | 654.4498 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1927.4678 | -147.9883 | 3.86 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1192.1235 | 25.3994 | 2 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2003.2817 | -1.7704 | 3.13 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2001.2101 | 78.2174 | 3.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.415 | 203] 1.5 [DL + RSY] | 2225.3106 | -211.6745 | -57.6669 |
| Bottom | 0.422 | 203] 1.5 [DL + RSY] | 2301.1245 | 215.9635 | 34.9408 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2011.8694 | 113.3942 | 64.2172 | 195.6194 | 658.9759 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2087.6832 | 133.6341 | 64.8363 | 197.3783 | 660.7348 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2292.448 | -175.1284 | 4.59 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2292.448 | 113.3942 | 4.23 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2368.2618 | -121.2944 | 4.4 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2368.2618 | 133.6341 | 4.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.444 | 203] 1.5 [DL + RSY] | 2526.3052 | -222.6228 | 29.614 |
| Bottom | 0.445 | 203] 1.5 [DL + RSY] | 2602.1191 | 218.624 | 29.9417 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2280.3878 | 163.2263 | -52.6335 | 201.849 | 665.2055 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2356.2017 | 134.0812 | -53.3728 | 203.6079 | 666.9644 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2659.7163 | -153.579 | 5.04 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2659.7163 | 163.2263 | 5.09 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2735.5302 | -130.0693 | 5.02 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2735.5302 | 134.0812 | 5.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.46 | 203] 1.5 [DL + RSY] | 2830.2693 | -219.1255 | 23.91 |
| Bottom | 0.463 | 203] 1.5 [DL + RSY] | 2906.0831 | 216.8594 | -27.6082 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2547.8979 | 160.6984 | -51.2822 | 208.0552 | 671.4118 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2623.7118 | 133.5914 | -51.9751 | 209.8141 | 673.1706 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3025.5097 | -160.4976 | 5.65 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3025.5097 | 160.6984 | 5.65 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3101.3236 | -135.114 | 5.62 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3101.3236 | 133.5914 | 5.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.48 | 203] 1.5 [DL + RSY] | 3138.5066 | -218.4395 | -26.8277 |
| Bottom | 0.485 | 203] 1.5 [DL + RSY] | 3214.3205 | 215.9293 | -26.3232 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2814.9467 | 156.9208 | 51.7628 | 214.2508 | 677.6073 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2890.7606 | 136.3338 | 52.3815 | 216.0096 | 679.3662 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3389.1081 | -164.4171 | 6.24 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3389.1081 | 156.9208 | 6.19 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3464.922 | -137.1973 | 6.2 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3464.922 | 136.3338 | 6.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.507 | 203] 1.5 [DL + RSY] | 3451.7174 | -217.1139 | -27.1726 |
| Bottom | 0.511 | 203] 1.5 [DL + RSY] | 3527.5313 | 214.7975 | 25.1977 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3081.8226 | 155.2424 | 51.632 | 220.4423 | 683.7988 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3157.6365 | 139.6327 | 52.1872 | 222.2012 | 685.5577 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3750.2106 | -164.8575 | 6.8 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3750.2106 | 155.2424 | 6.75 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3826.0245 | -139.1775 | 6.77 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3826.0245 | 139.6327 | 6.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.525 | 203] 1.5 [DL + RSY] | 3768.3855 | -215.6598 | -27.4217 |
| Bottom | 0.529 | 203] 1.5 [DL + RSY] | 3844.1994 | 213.5742 | 24.8019 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3348.6095 | 152.9556 | 51.304 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3424.4234 | 142.8717 | 51.8187 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4108.4888 | -164.3737 | 7.36 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4108.4888 | 152.9556 | 7.29 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4184.3027 | -141.33 | 7.34 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4184.3027 | 142.8717 | 7.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.556 | 202] 1.5 [DL + RSX] | 4463.6195 | -163.3418 | -163.1933 |
| Bottom | 0.558 | 202] 1.5 [DL + RSX] | 4539.4334 | 159.1519 | 145.854 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3615.3521 | 149.4361 | 50.9288 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3691.166 | 145.854 | 51.4322 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4463.6195 | -163.1933 | 7.9 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4463.6195 | 149.4361 | 7.82 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4539.4334 | -143.2041 | 7.9 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4539.4334 | 145.854 | 7.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.588 | 202] 1.5 [DL + RSX] | 4815.2529 | -161.6601 | -160.8134 |
| Bottom | 0.593 | 202] 1.5 [DL + RSX] | 4891.0668 | 157.9473 | 150.7682 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3882.0678 | 144.4443 | 51.2849 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3957.8816 | 150.7682 | 51.7993 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4815.2529 | -160.8134 | 8.44 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4815.2529 | 144.4443 | 8.34 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4891.0668 | -142.4231 | 8.45 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4891.0668 | 150.7682 | 8.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.621 | 202] 1.5 [DL + RSX] | 5162.9673 | -159.2679 | -154.243 |
| Bottom | 0.627 | 202] 1.5 [DL + RSX] | 5238.7812 | 156.5697 | 167.2945 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4148.7218 | 139.8005 | 54.755 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4224.5356 | 167.2945 | 55.2789 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5162.9673 | -154.243 | 8.94 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5162.9673 | 139.8005 | 8.86 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5238.7812 | -132.6288 | 8.93 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5238.7812 | 167.2945 | 9.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.653 | 202] 1.5 [DL + RSX] | 5506.2831 | -155.1153 | 143.0712 |
| Bottom | 0.661 | 202] 1.5 [DL + RSX] | 5582.097 | 154.2985 | 178.7768 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4415.2184 | 143.0712 | 52.4075 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4491.0322 | 178.7768 | 52.8772 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5506.2831 | -134.1224 | 9.36 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5506.2831 | 143.0712 | 9.41 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5582.097 | -146.5847 | 9.55 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5582.097 | 178.7768 | 9.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.681 | 202] 1.5 [DL + RSX] | 5842.8038 | -147.2911 | 132.0414 |
| Bottom | 0.704 | 202] 1.5 [DL + RSX] | 5918.6176 | 147.5297 | -474.3928 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4680.3107 | 132.0414 | -134.5372 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4756.1246 | -148.468 | -134.5958 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5842.8038 | -126.3687 | 9.84 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5842.8038 | 132.0414 | 9.87 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5918.6176 | -148.468 | 10.08 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.642 | 202] 1.5 [DL + RSX] | 6193.0401 | -169.9328 | 911.0632 |
| Bottom | 0.617 | 202] 1.5 [DL + RSX] | 6287.5122 | 166.553 | 316.0611 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4952.3688 | 911.0632 | -265.8906 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5046.8409 | 316.0611 | -265.6781 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6193.0401 | 911.0632 | 11.16 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6287.5122 | -239.705 | 8.76 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6287.5122 | 316.0611 | 9.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.633 | 202] 1.5 [DL + RSX] | 6560.0603 | -153.7544 | 265.1962 |
| Bottom | 0.643 | 202] 1.5 [DL + RSX] | 6654.5324 | 156.5647 | -334.006 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5218.1902 | 265.1962 | -88.7157 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5312.6623 | 240.5099 | -88.9153 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6560.0603 | -142.4503 | 8.73 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6560.0603 | 265.1962 | 9.19 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6654.5324 | -334.006 | 9.57 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6654.5324 | 240.5099 | 9.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.663 | 202] 1.5 [DL + RSX] | 6925.7387 | -154.7642 | -246.3564 |
| Bottom | 0.673 | 202] 1.5 [DL + RSX] | 7020.2108 | 154.3472 | -328.0428 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5487.759 | 188.7978 | 60.7682 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5582.2311 | 282.4003 | 61.0781 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6925.7387 | -246.3564 | 9.58 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6925.7387 | 188.7978 | 9.37 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7020.2108 | -328.0428 | 10.01 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7020.2108 | 282.4003 | 9.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.692 | 202] 1.5 [DL + RSX] | 7289.3695 | -150.3681 | -236.5975 |
| Bottom | 0.703 | 202] 1.5 [DL + RSX] | 7383.8416 | 150.3033 | -332.7313 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5760.3592 | 214.3523 | 58.2058 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5854.8313 | 313.3999 | 58.662 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7289.3695 | -236.5975 | 10 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7289.3695 | 214.3523 | 9.92 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7383.8416 | -332.7313 | 10.48 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7383.8416 | 313.3999 | 10.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.721 | 202] 1.5 [DL + RSX] | 7650.2697 | -146.8705 | -236.0752 |
| Bottom | 0.732 | 202] 1.5 [DL + RSX] | 7744.7418 | 146.8578 | -345.6997 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6035.7337 | 228.4586 | -56.4194 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6130.2058 | 336.2802 | -57.1172 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7650.2697 | -236.0752 | 10.45 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7650.2697 | 228.4586 | 10.42 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7744.7418 | -345.6997 | 10.98 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7744.7418 | 336.2802 | 10.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.749 | 202] 1.5 [DL + RSX] | 8008.0585 | -142.0733 | -243.8449 |
| Bottom | 0.761 | 202] 1.5 [DL + RSX] | 8102.5306 | 142.8238 | -362.0428 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6313.854 | 234.5294 | 57.2184 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6408.3261 | 361.7476 | 58.1955 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8008.0585 | -243.8449 | 10.92 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8008.0585 | 234.5294 | 10.89 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8102.5306 | -362.0428 | 11.49 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8102.5306 | 361.7476 | 11.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.777 | 202] 1.5 [DL + RSX] | 8362.35 | -136.1891 | -256.1801 |
| Bottom | 0.79 | 202] 1.5 [DL + RSX] | 8456.8221 | 138.7728 | 391.1091 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6594.6924 | 244.018 | 57.8005 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6689.1645 | 391.1091 | 58.98 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8362.35 | -256.1801 | 11.41 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8362.35 | 244.018 | 11.37 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8456.8221 | -389.101 | 12.03 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8456.8221 | 391.1091 | 12.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.804 | 202] 1.5 [DL + RSX] | 8712.8655 | -127.165 | -283.9269 |
| Bottom | 0.818 | 202] 1.5 [DL + RSX] | 8807.3376 | 129.4519 | -451.976 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6878.4248 | 261.3786 | -58.3411 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6972.8969 | 409.2652 | -59.5429 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8712.8655 | -283.9269 | 11.96 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8712.8655 | 261.3786 | 11.87 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8807.3376 | -451.976 | 12.7 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8807.3376 | 409.2652 | 12.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.834 | 202] 1.5 [DL + RSX] | 9059.1328 | -122.1483 | -354.6156 |
| Bottom | 0.857 | 202] 1.5 [DL + RSX] | 9156.604 | 149.0942 | -594.1272 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7164.2369 | 273.6653 | -73.8671 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7261.7081 | 419.1758 | -74.8579 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9059.1328 | -354.6156 | 12.65 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9059.1328 | 273.6653 | 12.35 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9156.604 | -594.1272 | 13.67 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9156.604 | 419.1758 | 13.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.856 | 202] 1.5 [DL + RSX] | 9527.0214 | -100.9421 | 489.5618 |
| Bottom | 0.876 | 202] 1.5 [DL + RSX] | 9652.9842 | 109.4226 | -964.2314 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7599.8644 | 489.5618 | -182.0956 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7725.8272 | 800.9678 | -182.8391 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9527.0214 | -202.8458 | 12.67 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9527.0214 | 489.5618 | 13.74 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9652.9842 | -964.2314 | 15.68 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9652.9842 | 800.9678 | 15.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.881 | 202] 1.5 [DL + RSX] | 9937.9252 | -29.5187 | 816.2575 |
| Bottom | 0.96 | 202] 1.5 [DL + RSX] | 10058.4895 | 56.0162 | -1729.4659 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7985.8938 | 816.2575 | -254.0336 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8106.4582 | 1649.3008 | -254.1666 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9937.9252 | -703.8709 | 15.06 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9937.9252 | 816.2575 | 15.48 | 6 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10058.4895 | -1729.4659 | 19.06 | 6 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10058.4895 | 1649.3008 | 18.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.514 | 203] 1.5 [DL + RSY] | 1737.7472 | 244.2951 | 198.58 |
| Bottom | 0.399 | 203] 1.5 [DL + RSY] | 1985.5007 | -209.9286 | 35.3754 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1690.4174 | 317.0023 | -117.881 | 188.1617 | 651.5182 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1766.2313 | 130.3932 | -117.9798 | 189.9206 | 653.2771 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 1227.5298 | -22.9507 | 2.05 | 6 |
| Top–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 1957.0167 | 317.0023 | 4.89 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2032.8305 | -100.726 | 3.75 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2032.8305 | 130.3932 | 3.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.388 | 203] 1.5 [DL + RSY] | 2229.2706 | 189.1362 | 57.2294 |
| Bottom | 0.395 | 203] 1.5 [DL + RSY] | 2305.0845 | -192.9299 | -39.3914 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1975.9038 | 186.7116 | -68.6305 | 194.785 | 658.1415 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2051.7177 | 109.9339 | -69.3196 | 196.5439 | 659.9004 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2341.9875 | -108.5479 | 4.28 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2341.9875 | 186.7116 | 4.74 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2417.8014 | -150.2742 | 4.64 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2417.8014 | 109.9339 | 4.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.419 | 203] 1.5 [DL + RSY] | 2551.0612 | 201.2067 | 20.2214 |
| Bottom | 0.421 | 203] 1.5 [DL + RSY] | 2626.875 | -196.7485 | -34.2859 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2257.8452 | 165.0897 | -55.5984 | 201.326 | 664.6825 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2333.6591 | 117.1891 | -56.3924 | 203.0849 | 666.4414 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2724.1295 | -158.5284 | 5.17 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2724.1295 | 165.0897 | 5.2 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2799.9434 | -148.266 | 5.22 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2799.9434 | 117.1891 | 5.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.439 | 203] 1.5 [DL + RSY] | 2874.827 | 198.8232 | 22.3128 |
| Bottom | 0.444 | 203] 1.5 [DL + RSY] | 2950.6409 | -196.2119 | -30.5377 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2537.6027 | 170.2058 | -55.3525 | 207.8164 | 671.1729 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2613.4166 | 122.5687 | -56.0764 | 209.5753 | 672.9318 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3102.9528 | -157.3968 | 5.75 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3102.9528 | 170.2058 | 5.82 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3178.7667 | -147.3184 | 5.81 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3178.7667 | 122.5687 | 5.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.468 | 203] 1.5 [DL + RSY] | 3200.0745 | 199.1238 | 23.828 |
| Bottom | 0.472 | 203] 1.5 [DL + RSY] | 3275.8883 | -196.3708 | -29.7718 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2815.4312 | 172.1799 | -55.3442 | 214.262 | 677.6185 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2891.245 | 125.3729 | -55.9862 | 216.0209 | 679.3774 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3478.0983 | -154.8654 | 6.32 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3478.0983 | 172.1799 | 6.42 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3553.9122 | -149.67 | 6.41 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3553.9122 | 125.3729 | 6.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.496 | 203] 1.5 [DL + RSY] | 3525.7855 | 198.8049 | 23.2292 |
| Bottom | 0.501 | 203] 1.5 [DL + RSY] | 3601.5993 | -196.2711 | -29.4976 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3091.7255 | 171.1268 | -54.5645 | 220.672 | 684.0286 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3167.5393 | 128.1448 | -55.1373 | 222.4309 | 685.7874 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3849.4768 | -154.2 | 6.89 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3849.4768 | 171.1268 | 6.99 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3925.2907 | -152.7437 | 7 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3925.2907 | 128.1448 | 6.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.52 | 202] 1.5 [DL + RSX] | 4216.9069 | 146.7084 | 169.4373 |
| Bottom | 0.523 | 202] 1.5 [DL + RSX] | 4292.7208 | -141.7532 | -155.8621 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3366.6808 | 169.4373 | -53.6734 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3442.4946 | 131.0544 | -54.2023 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4216.9069 | -153.0008 | 7.46 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4216.9069 | 169.4373 | 7.56 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4292.7208 | -155.8621 | 7.59 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4292.7208 | 131.0544 | 7.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.555 | 202] 1.5 [DL + RSX] | 4580.1964 | 146.6076 | 167.1312 |
| Bottom | 0.56 | 202] 1.5 [DL + RSX] | 4656.0103 | -141.9717 | -158.6551 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3640.4528 | 167.1312 | -52.8003 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3716.2666 | 133.5407 | -53.3167 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4580.1964 | -150.512 | 8.01 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4580.1964 | 167.1312 | 8.11 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4656.0103 | -158.6551 | 8.18 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4656.0103 | 133.5407 | 8.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.591 | 202] 1.5 [DL + RSX] | 4939.1094 | 145.8496 | 163.5774 |
| Bottom | 0.596 | 202] 1.5 [DL + RSX] | 5014.9232 | -141.6722 | -163.5024 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3913.1507 | 163.5774 | -52.8194 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3988.9646 | 133.2864 | -53.3458 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4939.1094 | -146.3524 | 8.55 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4939.1094 | 163.5774 | 8.65 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5014.9232 | -163.5024 | 8.76 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5014.9232 | 133.2864 | 8.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.625 | 202] 1.5 [DL + RSX] | 5293.3522 | 144.3565 | 155.6383 |
| Bottom | 0.632 | 202] 1.5 [DL + RSX] | 5369.1661 | -141.1276 | -180.6841 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4184.8339 | 155.6383 | -56.3381 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4260.6477 | 124.4932 | -56.8739 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5293.3522 | -142.3301 | 9.07 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5293.3522 | 155.6383 | 9.15 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5369.1661 | -180.6841 | 9.42 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5369.1661 | 124.4932 | 9.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.658 | 202] 1.5 [DL + RSX] | 5642.4871 | 141.2398 | -145.6217 |
| Bottom | 0.667 | 202] 1.5 [DL + RSX] | 5718.301 | -140.1099 | -192.5794 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4455.4615 | 133.4027 | -53.4771 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4531.2754 | 138.9725 | -53.9534 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5642.4871 | -145.6217 | 9.64 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5642.4871 | 133.4027 | 9.57 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5718.301 | -192.5794 | 10.03 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5718.301 | 138.9725 | 9.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.688 | 202] 1.5 [DL + RSX] | 5984.4252 | 133.6265 | -135.1463 |
| Bottom | 0.706 | 202] 1.5 [DL + RSX] | 6060.2391 | -133.5596 | 469.7468 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4723.8762 | 124.1917 | 130.5561 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4799.6901 | 469.7468 | 130.5124 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5984.4252 | -135.1463 | 10.11 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5984.4252 | 124.1917 | 10.04 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6060.2391 | 469.7468 | 12.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.643 | 202] 1.5 [DL + RSX] | 6337.9519 | 153.6 | -930.3146 |
| Bottom | 0.622 | 202] 1.5 [DL + RSX] | 6432.424 | -149.8865 | -339.3927 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5003.8879 | -576.4237 | 264.2679 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5098.36 | 230.3218 | 263.8547 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6337.9519 | -576.4237 | 10.08 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6432.424 | -339.3927 | 9.31 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6432.424 | 230.3218 | 8.9 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.639 | 202] 1.5 [DL + RSX] | 6706.5071 | 140.168 | -278.6118 |
| Bottom | 0.649 | 202] 1.5 [DL + RSX] | 6800.9792 | -142.0637 | 325.5077 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5282.2535 | 140.1621 | 84.0575 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5376.7256 | 325.5077 | 84.229 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6706.5071 | -278.6118 | 9.43 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6706.5071 | 140.1621 | 8.91 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6800.9792 | -259.1739 | 9.47 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6800.9792 | 325.5077 | 9.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.67 | 202] 1.5 [DL + RSX] | 7072.6268 | 142.1553 | 244.1456 |
| Bottom | 0.68 | 202] 1.5 [DL + RSX] | 7167.0989 | -140.9609 | 318.1503 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5562.2647 | 244.1456 | -59.3214 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5656.7368 | 318.1503 | -59.6175 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7072.6268 | -200.0285 | 9.59 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7072.6268 | 244.1456 | 9.76 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7167.0989 | -297.7768 | 10.08 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7167.0989 | 318.1503 | 10.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.699 | 202] 1.5 [DL + RSX] | 7436.1185 | 139.1799 | 233.0789 |
| Bottom | 0.71 | 202] 1.5 [DL + RSX] | 7530.5906 | -138.2513 | -327.0637 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5844.4457 | 233.0789 | -56.9897 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5938.9178 | 321.8494 | -57.4335 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7436.1185 | -224.312 | 10.14 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7436.1185 | 233.0789 | 10.17 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7530.5906 | -327.0637 | 10.64 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7530.5906 | 321.8494 | 10.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.729 | 202] 1.5 [DL + RSX] | 7796.1073 | 136.996 | -238.2636 |
| Bottom | 0.74 | 202] 1.5 [DL + RSX] | 7890.5794 | -136.0954 | -348.7096 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6128.6479 | 231.2013 | -54.735 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6223.12 | 334.2015 | -55.4338 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7796.1073 | -238.2636 | 10.64 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7796.1073 | 231.2013 | 10.61 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7890.5794 | -348.7096 | 11.17 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7890.5794 | 334.2015 | 11.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.758 | 202] 1.5 [DL + RSX] | 8152.2356 | 133.5958 | -244.7983 |
| Bottom | 0.77 | 202] 1.5 [DL + RSX] | 8246.7077 | -133.4785 | -373.406 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6415.0699 | 238.3405 | -55.5485 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6509.542 | 350.8846 | -56.5398 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8152.2356 | -244.7983 | 11.11 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8152.2356 | 238.3405 | 11.08 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8246.7077 | -373.406 | 11.71 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8246.7077 | 350.8846 | 11.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.786 | 202] 1.5 [DL + RSX] | 8504.1571 | 129.001 | -255.6825 |
| Bottom | 0.799 | 202] 1.5 [DL + RSX] | 8598.6292 | -130.3704 | -402.3334 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6703.859 | 251.6721 | -55.8522 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6798.3311 | 380.149 | -57.0548 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8504.1571 | -255.6825 | 11.59 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8504.1571 | 251.6721 | 11.57 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8598.6292 | -402.3334 | 12.26 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8598.6292 | 380.149 | 12.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.814 | 202] 1.5 [DL + RSX] | 8851.6195 | 122.198 | 282.5447 |
| Bottom | 0.828 | 202] 1.5 [DL + RSX] | 8946.0916 | -125.0955 | 443.3405 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6995.1516 | 282.5447 | 55.125 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7089.6237 | 443.3405 | 56.3489 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8851.6195 | -274.9995 | 12.1 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8851.6195 | 282.5447 | 12.12 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8946.0916 | -425.4325 | 12.78 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8946.0916 | 443.3405 | 12.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 202] 1.5 [DL + RSX] | 9194.7037 | 114.3673 | 354.8207 |
| Bottom | 0.862 | 202] 1.5 [DL + RSX] | 9292.1749 | -132.6068 | 553.5975 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7288.9526 | 354.8207 | 60.1962 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7386.4238 | 553.5975 | 61.1708 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9194.7037 | -293.678 | 12.59 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9194.7037 | 354.8207 | 12.82 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9292.1749 | -474.5641 | 13.39 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9292.1749 | 553.5975 | 13.69 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.859 | 202] 1.5 [DL + RSX] | 9598.7164 | 91.2361 | 237.8212 |
| Bottom | 0.885 | 202] 1.5 [DL + RSX] | 9724.6792 | -2.9294 | 972.8051 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7675.771 | 237.8212 | 175.3452 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7801.7338 | 972.8051 | 176.0851 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9598.7164 | -480.7627 | 13.8 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9598.7164 | 237.8212 | 12.89 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9724.6792 | -826.9031 | 15.26 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9724.6792 | 972.8051 | 15.8 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.892 | 202] 1.5 [DL + RSX] | 10012.0758 | 24.5623 | -840.6702 |
| Bottom | 0.968 | 202] 1.5 [DL + RSX] | 10132.6402 | -56.8413 | 1746.0245 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8075.2067 | 702.4926 | 258.3679 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8195.7711 | 1746.0245 | 258.4996 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 10012.0758 | -840.6702 | 15.67 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 10012.0758 | 702.4926 | 15.15 | 6 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10132.6402 | -1694.1652 | 19.02 | 6 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10132.6402 | 1746.0245 | 19.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.502 | 203] 1.5 [DL + RSY] | 1703.3586 | 239.8829 | -186.0712 |
| Bottom | 0.395 | 203] 1.5 [DL + RSY] | 1963.344 | -206.6063 | -40.8006 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1664.7779 | -42.6473 | 110.1483 | 187.5668 | 650.9234 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1740.5918 | 90.1695 | 110.2347 | 189.3257 | 652.6823 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1926.1108 | -42.6473 | 3.25 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1207.9331 | 26.4895 | 2.04 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2001.9247 | -138.3595 | 3.92 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2001.9247 | 90.1695 | 3.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.379 | 203] 1.5 [DL + RSY] | 2191.5813 | 184.2985 | -53.3828 |
| Bottom | 0.385 | 203] 1.5 [DL + RSY] | 2267.3952 | -188.647 | 26.0382 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1939.0876 | 111.5728 | 63.1859 | 193.9308 | 657.2874 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2014.9014 | 140.0495 | 63.8752 | 195.6897 | 659.0462 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2292.2299 | -180.3162 | 4.62 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2292.2299 | 111.5728 | 4.22 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2368.0437 | -117.9144 | 4.38 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2368.0437 | 140.0495 | 4.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.41 | 203] 1.5 [DL + RSY] | 2499.3974 | 197.0296 | -18.7633 |
| Bottom | 0.41 | 203] 1.5 [DL + RSY] | 2575.2113 | -192.5281 | 21.4261 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2211.2025 | 160.2433 | 51.0671 | 200.2439 | 663.6004 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2287.0163 | 138.5657 | 51.8654 | 202.0028 | 665.3593 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2657.6254 | -160.8587 | 5.08 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2657.6254 | 160.2433 | 5.07 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2733.4393 | -124.9684 | 4.99 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2733.4393 | 138.5657 | 5.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.429 | 203] 1.5 [DL + RSY] | 2810.0573 | 194.6008 | -21.9543 |
| Bottom | 0.433 | 203] 1.5 [DL + RSY] | 2885.8711 | -191.9553 | 18.063 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2482.106 | 158.0906 | 51.3269 | 206.5289 | 669.8854 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2557.9199 | 137.9062 | 52.0544 | 208.2877 | 671.6443 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3021.0697 | -167.0838 | 5.68 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3021.0697 | 158.0906 | 5.63 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3096.8835 | -130.2037 | 5.58 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3096.8835 | 137.9062 | 5.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.457 | 203] 1.5 [DL + RSY] | 3123.281 | 195.0151 | -24.6518 |
| Bottom | 0.461 | 203] 1.5 [DL + RSY] | 3199.0949 | -192.1981 | 17.7435 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2752.1055 | 154.4145 | 51.8461 | 212.7928 | 676.1494 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2827.9194 | 140.54 | 52.4896 | 214.5517 | 677.9083 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3382.2084 | -170.2413 | 6.26 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3382.2084 | 154.4145 | 6.17 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3458.0223 | -132.8266 | 6.16 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3458.0223 | 140.54 | 6.2 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.485 | 203] 1.5 [DL + RSY] | 3438.2771 | 194.7711 | -25.0813 |
| Bottom | 0.488 | 203] 1.5 [DL + RSY] | 3514.091 | -192.2304 | 17.9866 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3021.572 | 152.7228 | 51.5457 | 219.0445 | 682.401 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3097.3859 | 143.9026 | 52.1181 | 220.8034 | 684.1599 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3740.8632 | -170.2515 | 6.82 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3740.8632 | 152.7228 | 6.72 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3816.6771 | -135.387 | 6.73 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3816.6771 | 143.9026 | 6.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.508 | 202] 1.5 [DL + RSX] | 4096.8144 | 145.09 | -169.538 |
| Bottom | 0.51 | 202] 1.5 [DL + RSX] | 4172.6283 | -140.3422 | 147.2983 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3290.7024 | 150.5853 | 51.0907 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3366.5163 | 147.2983 | 51.6177 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4096.8144 | -169.538 | 7.37 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4096.8144 | 150.5853 | 7.26 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4172.6283 | -138.0549 | 7.3 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4172.6283 | 147.2983 | 7.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 202] 1.5 [DL + RSX] | 4449.8525 | 144.9597 | -168.1478 |
| Bottom | 0.545 | 202] 1.5 [DL + RSX] | 4525.6663 | -140.57 | 150.3715 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3559.6636 | 147.2205 | 50.6261 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3635.4774 | 150.3715 | 51.1401 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4449.8525 | -168.1478 | 7.91 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4449.8525 | 147.2205 | 7.79 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4525.6663 | -140.2445 | 7.87 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4525.6663 | 150.3715 | 7.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.576 | 202] 1.5 [DL + RSX] | 4799.7471 | 144.2268 | -165.4485 |
| Bottom | 0.581 | 202] 1.5 [DL + RSX] | 4875.561 | -140.3895 | 155.487 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3828.5904 | 142.2519 | 51.0217 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3904.4042 | 155.487 | 51.5456 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4799.7471 | -165.4485 | 8.44 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4799.7471 | 142.2519 | 8.3 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4875.561 | -139.6072 | 8.41 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4875.561 | 155.487 | 8.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.61 | 202] 1.5 [DL + RSX] | 5146.2532 | 142.7169 | -158.3513 |
| Bottom | 0.616 | 202] 1.5 [DL + RSX] | 5222.0671 | -139.792 | 172.6152 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4097.5974 | 137.4841 | 54.7902 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4173.4112 | 172.6152 | 55.3231 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5146.2532 | -158.3513 | 8.94 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5146.2532 | 137.4841 | 8.82 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5222.0671 | -130.4522 | 8.89 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5222.0671 | 172.6152 | 9.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.642 | 202] 1.5 [DL + RSX] | 5488.9025 | 139.9144 | 140.0535 |
| Bottom | 0.651 | 202] 1.5 [DL + RSX] | 5564.7164 | -139.3456 | 184.4809 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4366.6346 | 140.0535 | 52.3737 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4442.4484 | 184.4809 | 52.8467 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5488.9025 | -137.2436 | 9.35 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5488.9025 | 140.0535 | 9.37 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5564.7164 | -145.1717 | 9.51 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5564.7164 | 184.4809 | 9.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 202] 1.5 [DL + RSX] | 5826.125 | 132.443 | -129.5239 |
| Bottom | 0.691 | 202] 1.5 [DL + RSX] | 5901.9388 | -133.381 | -470.6148 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4634.9652 | 128.2579 | -128.1318 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4710.7791 | -141.89 | -128.0774 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5826.125 | -129.5239 | 9.83 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5826.125 | 128.2579 | 9.82 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5901.9388 | -141.89 | 10.02 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.628 | 202] 1.5 [DL + RSX] | 6175.7966 | 151.7118 | 903.7257 |
| Bottom | 0.607 | 202] 1.5 [DL + RSX] | 6270.2687 | -148.2239 | 326.3276 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4913.6493 | 903.7257 | -260.5479 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5008.1214 | 326.3276 | -260.1393 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6175.7966 | 903.7257 | 11.11 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6270.2687 | -241.0873 | 8.74 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6270.2687 | 326.3276 | 9.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.625 | 202] 1.5 [DL + RSX] | 6541.1072 | 141.5481 | 267.021 |
| Bottom | 0.635 | 202] 1.5 [DL + RSX] | 6635.5793 | -142.4978 | -335.023 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5191.563 | 267.021 | -83.072 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5286.0352 | 248.6276 | -83.2377 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6541.1072 | -151.0991 | 8.74 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6541.1072 | 267.021 | 9.18 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6635.5793 | -335.023 | 9.55 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6635.5793 | 248.6276 | 9.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.656 | 202] 1.5 [DL + RSX] | 6903.9459 | 141.3164 | -253.9264 |
| Bottom | 0.665 | 202] 1.5 [DL + RSX] | 6998.418 | -140.3582 | -327.1773 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5470.9585 | 190.1288 | 59.2277 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5565.4306 | 287.5181 | 59.5213 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6903.9459 | -253.9264 | 9.58 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6903.9459 | 190.1288 | 9.34 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6998.418 | -327.1773 | 9.97 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6998.418 | 287.5181 | 9.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.684 | 202] 1.5 [DL + RSX] | 7264.596 | 138.2263 | -243.3916 |
| Bottom | 0.695 | 202] 1.5 [DL + RSX] | 7359.0681 | -137.3104 | -330.4326 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5752.7801 | 214.1722 | 57.1433 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5847.2522 | 317.0561 | 57.5871 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7264.596 | -243.3916 | 9.99 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7264.596 | 214.1722 | 9.88 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7359.0681 | -330.4326 | 10.44 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7359.0681 | 317.0561 | 10.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.713 | 202] 1.5 [DL + RSX] | 7622.168 | 135.5784 | -241.956 |
| Bottom | 0.724 | 202] 1.5 [DL + RSX] | 7716.6401 | -134.7638 | -342.3157 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6036.8369 | 227.9235 | 55.1426 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6131.309 | 339.0892 | 55.8439 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7622.168 | -241.956 | 10.44 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7622.168 | 227.9235 | 10.38 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7716.6401 | -342.3157 | 10.93 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7716.6401 | 339.0892 | 10.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.742 | 202] 1.5 [DL + RSX] | 7976.3305 | 131.7662 | -249.4565 |
| Bottom | 0.754 | 202] 1.5 [DL + RSX] | 8070.8026 | -131.7955 | 364.1011 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6323.3191 | 234.3709 | 56.1447 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6417.7912 | 364.1011 | 57.1409 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7976.3305 | -249.4565 | 10.91 | 6 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7976.3305 | 234.3709 | 10.85 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8070.8026 | -358.6819 | 11.43 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8070.8026 | 364.1011 | 11.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.77 | 202] 1.5 [DL + RSX] | 8326.7937 | 126.7721 | -263.2537 |
| Bottom | 0.783 | 202] 1.5 [DL + RSX] | 8421.2658 | -128.3095 | 392.9367 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6612.3936 | 245.0539 | 56.5287 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6706.8657 | 392.9367 | 57.7372 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8326.7937 | -263.2537 | 11.4 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8326.7937 | 245.0539 | 11.33 | 6 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8421.2658 | -388.2284 | 11.98 | 6 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 8421.2658 | 392.9367 | 12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.798 | 202] 1.5 [DL + RSX] | 8673.2505 | 119.7543 | -295.0394 |
| Bottom | 0.812 | 202] 1.5 [DL + RSX] | 8767.7226 | -123.2417 | -453.0394 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6904.0993 | 263.7461 | -54.1478 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6998.5714 | 414.7294 | -55.377 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8673.2505 | -295.0394 | 11.95 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8673.2505 | 263.7461 | 11.83 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8767.7226 | -453.0394 | 12.66 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8767.7226 | 414.7294 | 12.51 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.827 | 202] 1.5 [DL + RSX] | 9016.4545 | 110.8131 | -370 |
| Bottom | 0.845 | 202] 1.5 [DL + RSX] | 9113.9257 | -128.3141 | -568.3556 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7199.0958 | 280.0863 | -60.0387 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7296.5671 | 459.441 | -61.0173 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9016.4545 | -370 | 12.66 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9016.4545 | 280.0863 | 12.32 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9113.9257 | -568.3556 | 13.52 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9113.9257 | 459.441 | 13.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.842 | 202] 1.5 [DL + RSX] | 9413.6831 | 87.5967 | -244.6158 |
| Bottom | 0.868 | 202] 1.5 [DL + RSX] | 9539.6459 | -5.1587 | -974.0153 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7579.9433 | 476.7871 | -174.2596 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7705.9061 | 814.6975 | -175.0047 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9413.6831 | -244.6158 | 12.68 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9413.6831 | 476.7871 | 13.56 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9539.6459 | -974.0153 | 15.58 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9539.6459 | 814.6975 | 14.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.871 | 202] 1.5 [DL + RSX] | 9817.6195 | 29.3704 | 835.4688 |
| Bottom | 0.953 | 202] 1.5 [DL + RSX] | 9938.1839 | -56.4766 | -1755.8484 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7969.3798 | 835.4688 | -256.9829 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8089.9442 | 1681.7242 | -257.1153 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9817.6195 | -718.0312 | 14.96 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9817.6195 | 835.4688 | 15.41 | 6 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 9938.1839 | -1755.8484 | 19.01 | 6 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 9938.1839 | 1681.7242 | 18.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.705 | 202] 1.5 [DL + RSX] | 1071.5024 | 285.1051 | 636.2453 |
| Bottom | 2.235 | 206] [0.9 DL + 1.5 RSX] | 542.4093 | -213.6817 | -170.9174 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1268.9049 | 697.3038 | -302.1289 | 140.7986 | 487.2334 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1325.5882 | -67.4591 | -302.3811 | 142.1136 | 488.5484 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1744.013 | 636.2453 | 8.6 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1800.6963 | -106.3777 | 4.58 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1017.5174 | 1.8647 | 2.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.922 | 206] [0.9 DL + 1.5 RSX] | 605.0539 | 199.1478 | 139.2207 |
| Bottom | 1.904 | 206] [0.9 DL + 1.5 RSX] | 639.0639 | -200.8284 | -152.4624 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1463.3285 | 244.5401 | -141.7365 | 145.3092 | 491.744 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1520.0118 | -31.1578 | -142.2134 | 146.6243 | 493.0591 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1773.0099 | -4.3975 | 3.73 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1984.0169 | 187.2492 | 5.6 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2040.7001 | -75.1359 | 4.84 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1159.7522 | 25.7418 | 2.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.32 | 206] [0.9 DL + 1.5 RSX] | 701.689 | 205.1853 | 152.6532 |
| Bottom | 1.281 | 206] [0.9 DL + 1.5 RSX] | 735.699 | -203.6589 | -149.4187 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1658.8555 | 274.7745 | -149.3266 | 172.3912 | 518.8259 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1715.5388 | -21.8875 | -149.8119 | 173.9041 | 520.3389 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1269.0666 | -45.542 | 3 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2226.2332 | 209.9614 | 6.28 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2282.9164 | -204.5387 | 6.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1303.0766 | 33.2326 | 2.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.253 | 206] [0.9 DL + 1.5 RSX] | 797.7877 | 205.2351 | 155.6314 |
| Bottom | 1.216 | 206] [0.9 DL + 1.5 RSX] | 831.7977 | -204.1731 | -148.6365 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1855.7348 | 281.1643 | -150.5283 | 177.646 | 524.0808 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1912.4181 | -18.1687 | -151.075 | 179.1589 | 525.5937 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1413.2661 | -49.8808 | 3.33 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2471.2132 | 213.4523 | 6.82 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2527.8964 | -203.365 | 6.86 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1447.276 | 36.5597 | 3.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.347 | 206] [0.9 DL + 1.5 RSX] | 893.4104 | 205.9014 | 155.8703 |
| Bottom | 1.303 | 206] [0.9 DL + 1.5 RSX] | 927.4204 | -204.784 | -147.9471 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2054.6126 | 282.4401 | -150.5226 | 166.759 | 513.1938 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2111.2959 | -14.6033 | -151.1349 | 168.138 | 514.5728 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1558.4957 | -55.7624 | 3.68 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2719.6978 | 212.5398 | 7.33 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2776.3811 | -68.2522 | 6.32 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1592.5056 | 39.4465 | 3.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.272 | 206] [0.9 DL + 1.5 RSX] | 988.5979 | 206.1396 | 155.8538 |
| Bottom | 1.228 | 206] [0.9 DL + 1.5 RSX] | 1022.6079 | -205.055 | -147.1202 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2256.2057 | 282.2184 | -150.553 | 171.6634 | 518.0982 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2312.8889 | -10.2516 | -151.2038 | 173.0424 | 519.4771 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2695.3362 | -4.7706 | 5.65 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2972.6355 | 211.3433 | 7.84 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3029.3188 | -65.3725 | 6.82 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1739.0378 | 42.8715 | 3.96 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.056 | 206] [0.9 DL + 1.5 RSX] | 1083.4023 | 205.9749 | 155.4861 |
| Bottom | 1.017 | 206] [0.9 DL + 1.5 RSX] | 1117.4123 | -204.937 | -146.0057 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2461.2199 | 280.1474 | -150.4456 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2517.9031 | -4.3438 | -151.0901 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2931.7236 | -8.933 | 6.18 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3230.9525 | 209.729 | 8.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3287.6357 | -61.9059 | 7.33 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1887.1449 | 47.6341 | 4.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.982 | 206] [0.9 DL + 1.5 RSX] | 1177.9488 | 205.2756 | 154.4174 |
| Bottom | 0.945 | 206] [0.9 DL + 1.5 RSX] | 1211.9588 | -204.3094 | -144.6364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2670.4146 | 276.2357 | -149.9603 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2727.0979 | 3.4598 | -150.5551 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3171.4309 | -11.7285 | 6.7 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3495.5276 | 207.3189 | 8.9 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3552.2108 | -57.8551 | 7.85 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3228.1141 | 3.4598 | 6.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.963 | 202] 1.5 [DL + RSX] | 3767.1607 | 238.3091 | 203.8116 |
| Bottom | 0.962 | 202] 1.5 [DL + RSX] | 3823.844 | -236.6337 | -192.631 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2884.638 | 270.8556 | -149.047 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2941.3213 | 12.5878 | -149.5655 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3414.9083 | -13.6087 | 7.22 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3767.1607 | 203.8116 | 9.44 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3823.844 | -53.4992 | 8.38 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3471.5915 | 12.5878 | 7.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.978 | 202] 1.5 [DL + RSX] | 4046.5509 | 233.666 | 198.6641 |
| Bottom | 0.977 | 202] 1.5 [DL + RSX] | 4103.2342 | -232.0655 | -189.7874 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3104.8525 | 264.014 | -147.0401 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3161.5358 | 22.3979 | -147.4804 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3662.5559 | -15.5719 | 7.75 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4046.5509 | 198.6641 | 9.98 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4103.2342 | -48.115 | 8.92 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3719.2392 | 22.3979 | 7.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.991 | 202] 1.5 [DL + RSX] | 4334.3884 | 227.8592 | 192.4156 |
| Bottom | 0.986 | 202] 1.5 [DL + RSX] | 4391.0716 | -227.0474 | -159.8223 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3332.2373 | 257.1569 | -136.1701 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3388.9205 | 72.5295 | -136.5418 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3914.8678 | -18.4242 | 8.3 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4334.3884 | 192.4156 | 10.53 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4391.0716 | -2.8505 | 9.17 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3971.551 | 72.5295 | 8.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.002 | 202] 1.5 [DL + RSX] | 4629.1951 | 217.4724 | 215.1083 |
| Bottom | 1.048 | 202] 1.5 [DL + RSX] | 4685.8784 | -213.7954 | -408.2462 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3566.7184 | 282.5046 | -223.7532 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3623.4016 | -187.8049 | -223.9502 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 2623.1172 | -40.8943 | 5.78 | 6 |
| Top–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4629.1951 | 86.9045 | 10.32 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4685.8784 | -408.2462 | 12.95 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.09 | 206] [0.9 DL + 1.5 RSX] | 1635.0647 | 233.9051 | 752.2127 |
| Bottom | 0.848 | 202] 1.5 [DL + RSX] | 5062.5607 | -252.3277 | -274.1904 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3800.8179 | 1302.1716 | -512.6708 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3878.7574 | 134.86 | -512.9618 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4984.6212 | 1188.1031 | 12.46 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5062.5607 | -53.6034 | 7.89 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4551.7289 | 134.86 | 7.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 202] 1.5 [DL + RSX] | 5337.885 | 233.202 | 269.2783 |
| Bottom | 0.855 | 202] 1.5 [DL + RSX] | 5415.8245 | -236.6185 | -275.6509 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4015.9381 | 387.8087 | -216.8516 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4093.8776 | 143.9053 | -217.507 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4785.6443 | -68.2057 | 7.53 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5337.885 | 269.2783 | 9.2 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5415.8245 | -62.6437 | 8.46 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4863.5837 | 143.9053 | 7.96 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.87 | 202] 1.5 [DL + RSX] | 5692.9282 | 230.4723 | 243.0445 |
| Bottom | 0.878 | 202] 1.5 [DL + RSX] | 5770.8677 | -231.1931 | -247.3357 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4230.9739 | 369.2644 | -202.6576 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4308.9134 | 179.1366 | -203.5535 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5099.5933 | -91.328 | 8.1 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5692.9282 | 243.0445 | 9.63 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5770.8677 | -39.5161 | 8.91 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5177.5328 | 179.1366 | 8.58 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.891 | 202] 1.5 [DL + RSX] | 6050.0368 | 220.7928 | 249.4235 |
| Bottom | 0.899 | 202] 1.5 [DL + RSX] | 6127.9763 | -222.4055 | -234.883 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4447.2897 | 370.081 | -204.3755 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4525.2291 | 199.3403 | -205.4434 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5414.889 | -68.6366 | 8.49 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6050.0368 | 249.4235 | 10.2 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6127.9763 | -34.8458 | 9.43 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5492.8284 | 199.3403 | 9.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.909 | 202] 1.5 [DL + RSX] | 6408.8754 | 209.9635 | 240.7904 |
| Bottom | 0.917 | 202] 1.5 [DL + RSX] | 6486.8149 | -212.0777 | -224.5102 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4665.9554 | 344.5479 | -200.7065 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4743.8949 | 225.475 | -201.8686 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5731.0572 | -54.6238 | 8.91 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6408.8754 | 240.7904 | 10.71 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6486.8149 | -30.1285 | 9.95 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5808.9967 | 225.475 | 9.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.926 | 202] 1.5 [DL + RSX] | 6769.2555 | 196.7527 | 228.7573 |
| Bottom | 0.936 | 202] 1.5 [DL + RSX] | 6847.195 | -199.6283 | -214.9357 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4888.3339 | 312.1987 | -195.019 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4966.2733 | 262.8196 | -196.1821 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6048.0076 | -38.7804 | 9.32 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6769.2555 | 228.7573 | 11.2 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6847.195 | -21.9961 | 10.47 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6125.9471 | 262.8196 | 10.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.948 | 202] 1.5 [DL + RSX] | 7130.6174 | 180.6623 | 215.8789 |
| Bottom | 0.96 | 202] 1.5 [DL + RSX] | 7208.5569 | -184.4296 | -208.3132 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5115.9632 | 286.0809 | -187.4537 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5193.9027 | 314.9938 | -188.5161 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6365.5106 | -29.7834 | 9.77 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7130.6174 | 215.8789 | 11.7 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7208.5569 | -6.9721 | 10.95 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6443.45 | 314.9938 | 11.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.968 | 202] 1.5 [DL + RSX] | 7491.6667 | 161.3018 | 204.5186 |
| Bottom | 0.982 | 202] 1.5 [DL + RSX] | 7569.6062 | -166.821 | -210.7439 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5350.5152 | 289.6921 | -177.8325 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5428.4547 | 382.5294 | -178.7063 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6682.9074 | -50.118 | 10.33 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7491.6667 | 204.5186 | 12.2 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7569.6062 | -210.7439 | 12.34 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7569.6062 | 18.7278 | 11.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.983 | 202] 1.5 [DL + RSX] | 7851.4758 | 135.7061 | 202.7063 |
| Bottom | 1.003 | 202] 1.5 [DL + RSX] | 7931.8896 | -145.6326 | -228.4665 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5594.2825 | 340.5668 | -158.2239 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5674.6963 | 445.6974 | -158.8791 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7000.018 | -117.3569 | 11.09 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7851.4758 | 202.7063 | 12.73 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7931.8896 | -228.4665 | 12.96 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7931.8896 | 49.1749 | 12.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.205 | 202] 1.5 [DL + RSX] | 8201.7907 | 329.8315 | 186.953 |
| Bottom | 1.235 | 202] 1.5 [DL + RSX] | 8305.71 | 332.8867 | -333.3027 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5847.7935 | 397.3023 | -133.5513 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5951.7128 | 580.9487 | -133.9837 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8201.7907 | -25.9752 | 12.53 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8201.7907 | 186.953 | 13.2 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8305.71 | -333.3027 | 13.96 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8305.71 | 110.4669 | 13.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.197 | 202] 1.5 [DL + RSX] | 8610.226 | 288.356 | 271.2198 |
| Bottom | 1.218 | 202] 1.5 [DL + RSX] | 8709.6916 | 291.035 | 344.5937 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6192.4943 | 612.4256 | -125.8499 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6291.9599 | 987.762 | -125.9256 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8610.226 | -112.0118 | 13.51 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8610.226 | 271.2198 | 14.17 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8709.6916 | -316.4155 | 14.5 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8709.6916 | 344.5937 | 14.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.657 | 206] [0.9 DL + 1.5 RSX] | 530.3989 | -230.3296 | 430.7082 |
| Bottom | 2.202 | 206] [0.9 DL + 1.5 RSX] | 564.4089 | 213.2169 | -180.0037 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1338.48 | 749.632 | -325.9716 | 142.4127 | 488.8475 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1395.1632 | -81.7344 | -326.2533 | 143.7278 | 490.1626 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1824.876 | 681.9795 | 9.13 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1881.5592 | -126.791 | 4.91 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.9 | 206] [0.9 DL + 1.5 RSX] | 619.4543 | -198.9761 | 142.3061 |
| Bottom | 1.884 | 206] [0.9 DL + 1.5 RSX] | 653.4643 | 200.7 | -158.2059 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1515.5703 | 254.6641 | -150.2065 | 146.5212 | 492.956 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1572.2536 | -38.8731 | -150.6988 | 147.8363 | 494.2711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1810.9253 | -6.2085 | 3.82 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2041.7421 | 191.9972 | 5.75 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2098.4254 | -219.7809 | 6.09 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1179.6362 | 22.7018 | 2.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.316 | 206] [0.9 DL + 1.5 RSX] | 709.2391 | -205.0766 | 158.081 |
| Bottom | 1.278 | 206] [0.9 DL + 1.5 RSX] | 743.2491 | 203.6572 | -154.3187 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1695.582 | 290.0954 | -159.1487 | 173.3714 | 519.8062 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1752.2653 | -27.9137 | -159.6494 | 174.8843 | 521.3191 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1276.8356 | -47.0498 | 3.03 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2263.1786 | 218.8424 | 6.42 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2319.8618 | -213.5126 | 6.5 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1310.8456 | 31.2802 | 2.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.255 | 206] [0.9 DL + 1.5 RSX] | 799.2324 | -205.2154 | 161.2992 |
| Bottom | 1.218 | 206] [0.9 DL + 1.5 RSX] | 833.2424 | 204.2764 | -153.0765 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1878.4776 | 296.6806 | -160.3933 | 178.253 | 524.6878 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1935.1608 | -23.3377 | -160.9543 | 179.7659 | 526.2007 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1410.0382 | -51.3874 | 3.34 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2489.2834 | 222.6226 | 6.93 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2545.9666 | -211.5885 | 6.96 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1444.0482 | 35.1743 | 3.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.354 | 206] [0.9 DL + 1.5 RSX] | 889.4018 | -205.9521 | 161.498 |
| Bottom | 1.311 | 206] [0.9 DL + 1.5 RSX] | 923.4118 | 204.9757 | -151.99 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2064.7326 | 297.3944 | -160.2661 | 167.0052 | 513.44 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2121.4158 | -18.9092 | -160.8879 | 168.3842 | 514.819 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1545.2588 | -57.3613 | 3.67 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2720.5896 | 221.5063 | 7.4 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2777.2728 | -78.3199 | 6.4 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1579.2688 | 38.6682 | 3.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.284 | 206] [0.9 DL + 1.5 RSX] | 979.7179 | -206.2622 | 161.4344 |
| Bottom | 1.24 | 206] [0.9 DL + 1.5 RSX] | 1013.7278 | 205.3326 | -150.8662 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2254.9358 | 296.5013 | -160.2159 | 171.6325 | 518.0673 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2311.6191 | -13.6649 | -160.8677 | 173.0115 | 519.4463 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2667.0776 | -3.0417 | 5.58 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2957.8928 | 220.1263 | 7.88 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3014.5761 | -75.0104 | 6.87 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1716.6849 | 42.8042 | 3.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.07 | 206] [0.9 DL + 1.5 RSX] | 1070.1618 | -206.1769 | 160.9664 |
| Bottom | 1.032 | 206] [0.9 DL + 1.5 RSX] | 1104.1718 | 205.3064 | -149.5265 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2449.6828 | 293.6281 | -159.9907 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2506.3661 | -6.7929 | -160.6266 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2890.5211 | -7.1717 | 6.08 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3202.0013 | 218.2577 | 8.38 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3258.6846 | -71.2705 | 7.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1856.4903 | 48.4063 | 4.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1 | 206] [0.9 DL + 1.5 RSX] | 1160.8 | -205.5718 | 159.7637 |
| Bottom | 0.961 | 206] [0.9 DL + 1.5 RSX] | 1194.81 | 204.7837 | -148.0066 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2649.6485 | 288.9388 | -159.3397 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2706.3317 | 1.936 | -159.9179 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3118.4931 | -10.0083 | 6.58 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3453.7132 | 215.5498 | 8.88 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3510.3965 | -67.0653 | 7.84 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3175.1764 | 1.936 | 6.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.963 | 202] 1.5 [DL + RSX] | 3713.7812 | -239.7734 | 211.6971 |
| Bottom | 0.962 | 202] 1.5 [DL + RSX] | 3770.4645 | 238.4225 | -199.0687 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2855.6192 | 282.9294 | -158.2177 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2912.3025 | 11.7537 | -158.7161 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3351.3906 | -12.1165 | 7.08 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3713.7812 | 211.6971 | 9.39 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3770.4645 | -62.6427 | 8.34 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3408.0739 | 11.7537 | 7.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.978 | 202] 1.5 [DL + RSX] | 3982.8896 | -235.4113 | 206.127 |
| Bottom | 0.978 | 202] 1.5 [DL + RSX] | 4039.5729 | 234.1488 | -196.0264 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3068.5236 | 275.6604 | -155.8554 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3125.2069 | 22.2729 | -156.2771 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3589.6011 | -14.5818 | 7.59 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3982.8896 | 206.127 | 9.91 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4039.5729 | -56.7619 | 8.86 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3646.2844 | 22.2729 | 7.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.99 | 202] 1.5 [DL + RSX] | 4261.7078 | -229.9201 | 199.704 |
| Bottom | 0.986 | 202] 1.5 [DL + RSX] | 4318.3911 | 229.4295 | -167.7816 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3289.4888 | 269.0223 | -145.5613 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3346.172 | 70.6497 | -145.9241 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3833.6022 | -17.7711 | 8.13 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4261.7078 | 199.704 | 10.44 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4318.3911 | -13.6189 | 9.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3890.2854 | 70.6497 | 8.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.001 | 202] 1.5 [DL + RSX] | 4548.9574 | -220.359 | 220.1977 |
| Bottom | 1.049 | 202] 1.5 [DL + RSX] | 4605.6406 | 217.4322 | -413.5398 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3518.6333 | 291.7913 | -230.5571 | 192.1728 | 538.6076 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3575.3166 | -184.7712 | -230.7608 | 192.1728 | 538.6076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 2562.1629 | -44.0052 | 5.68 | 6 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 4548.9574 | 220.1977 | 11.2 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4605.6406 | -413.5398 | 12.83 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.123 | 206] [0.9 DL + 1.5 RSX] | 1607.4919 | -236.9209 | 742.5044 |
| Bottom | 0.851 | 202] 1.5 [DL + RSX] | 4981.0202 | 257.6302 | -267.7543 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3753.0253 | 1294.2148 | -513.2777 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3830.9647 | 148.4225 | -513.5659 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4903.0807 | 1172.3965 | 12.27 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4981.0202 | -51.8995 | 7.76 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4463.13 | 148.4225 | 7.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.842 | 202] 1.5 [DL + RSX] | 5255.6286 | -237.2097 | 283.5892 |
| Bottom | 0.853 | 202] 1.5 [DL + RSX] | 5333.5681 | 240.9739 | -274.3536 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3967.8388 | 406.2788 | -226.0478 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4045.7783 | 148.8877 | -226.7206 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4697.8814 | -61.9658 | 7.37 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5255.6286 | 283.5892 | 9.13 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5333.5681 | -68.7187 | 8.37 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4775.8209 | 148.8877 | 7.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.868 | 202] 1.5 [DL + RSX] | 5609.695 | -234.1486 | 250.9838 |
| Bottom | 0.876 | 202] 1.5 [DL + RSX] | 5687.6344 | 235.074 | -246.1357 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4182.0245 | 379.3908 | -209.9201 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4259.964 | 182.3571 | -210.8236 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5012.5951 | -91.3192 | 7.97 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5609.695 | 250.9838 | 9.54 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5687.6344 | -47.0928 | 8.81 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5090.5346 | 182.3571 | 8.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.888 | 202] 1.5 [DL + RSX] | 5965.7279 | -223.9734 | 255.5397 |
| Bottom | 0.895 | 202] 1.5 [DL + RSX] | 6043.6674 | 225.8117 | -232.7744 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4397.0455 | 376.7063 | -210.5934 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4474.985 | 202.9388 | -211.6606 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5328.5597 | -69.6411 | 8.36 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5965.7279 | 255.5397 | 10.09 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6043.6674 | -41.6268 | 9.33 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5406.4991 | 202.9388 | 9.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.905 | 202] 1.5 [DL + RSX] | 6323.4377 | -212.6963 | 246.7011 |
| Bottom | 0.913 | 202] 1.5 [DL + RSX] | 6401.3772 | 215.0332 | -222.0736 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4614.107 | 349.0741 | -206.4235 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4692.0465 | 229.2968 | -207.5773 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5645.3091 | -54.6445 | 8.78 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6323.4377 | 246.7011 | 10.6 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6401.3772 | -36.2014 | 9.85 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5723.2485 | 229.2968 | 9.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.92 | 202] 1.5 [DL + RSX] | 6682.6468 | -199.0595 | 234.2485 |
| Bottom | 0.929 | 202] 1.5 [DL + RSX] | 6760.5863 | 202.155 | -212.6386 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4834.6126 | 313.7299 | -200.1108 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4912.552 | 266.9084 | -201.2593 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5962.7345 | -37.4705 | 9.19 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6682.6468 | 234.2485 | 11.09 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6760.5863 | -27.0718 | 10.36 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6040.674 | 266.9084 | 10.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.941 | 202] 1.5 [DL + RSX] | 7042.8025 | -182.5535 | 220.9104 |
| Bottom | 0.953 | 202] 1.5 [DL + RSX] | 7120.742 | 186.5634 | -206.7208 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5060.1397 | 283.8784 | -191.7707 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5138.0792 | 319.135 | -192.8156 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6280.5919 | -26.5572 | 9.63 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7042.8025 | 220.9104 | 11.58 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7120.742 | -10.584 | 10.83 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6358.5314 | 319.135 | 10.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.96 | 202] 1.5 [DL + RSX] | 7402.6394 | -162.6943 | 208.9276 |
| Bottom | 0.974 | 202] 1.5 [DL + RSX] | 7480.5789 | 168.408 | -210.5303 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5292.442 | 284.161 | -180.949 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5370.3815 | 383.7503 | -181.8069 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6598.236 | -45.4029 | 10.18 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7402.6394 | 208.9276 | 12.08 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7480.5789 | -210.5303 | 12.2 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7480.5789 | 15.5951 | 11.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.975 | 202] 1.5 [DL + RSX] | 7761.1273 | -136.7857 | 204.0634 |
| Bottom | 0.995 | 202] 1.5 [DL + RSX] | 7841.5411 | 147.1813 | -236.4817 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5533.747 | 330.7169 | -162.7324 | 229.68 | 706.0278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5614.1607 | 435.6476 | -163.3747 | 229.68 | 706.0278 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6915.3893 | -112.2917 | 10.94 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7761.1273 | 204.0634 | 12.6 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7841.5411 | -236.4817 | 12.86 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7841.5411 | 37.5116 | 12.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.193 | 202] 1.5 [DL + RSX] | 8101.2693 | 326.1676 | 200.6 |
| Bottom | 1.223 | 202] 1.5 [DL + RSX] | 8205.1886 | 329.2228 | -349.7559 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5774.8732 | 403.2258 | -142.3569 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5878.7925 | 586.7147 | -142.7793 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8101.2693 | -17.6732 | 12.35 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8101.2693 | 200.6 | 13.1 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8205.1886 | -349.7559 | 13.88 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8205.1886 | 111.3609 | 12.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.172 | 202] 1.5 [DL + RSX] | 8475.3525 | 277.8599 | 277.9147 |
| Bottom | 1.193 | 202] 1.5 [DL + RSX] | 8574.8181 | 280.5389 | 352.7215 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6095.3588 | 615.4339 | -133.2898 | 252.8736 | 729.2214 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6194.8244 | 996.8728 | -133.3642 | 252.8736 | 729.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8475.3525 | -102.134 | 13.26 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8475.3525 | 277.9147 | 13.99 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8574.8181 | -332.0448 | 14.36 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8574.8181 | 352.7215 | 14.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.72 | 202] 1.5 [DL + RSX] | 1088.7027 | -122.9901 | -168.3812 |
| Bottom | 0.538 | 202] 1.5 [DL + RSX] | 1294.826 | 110.46 | -30.2557 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1005.8722 | -130.4877 | 54.4845 | 114.0946 | 373.9207 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1048.3846 | 25.0173 | 54.8256 | 115.1477 | 374.9738 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1335.144 | -169.5966 | 6.06 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1377.6565 | -40.4396 | 4.39 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1377.6565 | 25.0173 | 4.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 202] 1.5 [DL + RSX] | 1505.1365 | -104.1243 | 52.044 |
| Bottom | 0.543 | 202] 1.5 [DL + RSX] | 1547.649 | 105.0973 | -31.7328 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1226.9459 | 70.6321 | -30.5291 | 119.571 | 379.397 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1269.4583 | 32.9538 | -30.8924 | 120.6241 | 380.4501 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1574.5026 | -38.1684 | 4.9 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1574.5026 | 70.6321 | 5.35 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1617.015 | -48.4961 | 5.17 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1617.015 | 32.9538 | 4.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.589 | 202] 1.5 [DL + RSX] | 1762.75 | -106.908 | 60.1067 |
| Bottom | 0.58 | 202] 1.5 [DL + RSX] | 1805.2624 | 105.6155 | -34.1085 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1446.5531 | 74.6717 | -32.7112 | 125.011 | 384.8371 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1489.0656 | 34.0695 | -33.121 | 126.0641 | 385.8902 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1814.2996 | -39.5735 | 5.59 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1814.2996 | 74.6717 | 6.08 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1856.8121 | -57.2542 | 5.95 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1856.8121 | 34.0695 | 5.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.621 | 202] 1.5 [DL + RSX] | 2022.9551 | -106.2403 | 59.5933 |
| Bottom | 0.613 | 202] 1.5 [DL + RSX] | 2065.4675 | 105.2737 | -33.5046 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1664.6957 | 73.1964 | -31.881 | 130.4147 | 390.2408 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1707.2082 | 37.3607 | -32.3487 | 131.4678 | 391.2939 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2053.6605 | -44.9219 | 6.33 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2053.6605 | 73.1964 | 6.72 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2096.173 | -59.5975 | 6.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2096.173 | 37.3607 | 6.34 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 202] 1.5 [DL + RSX] | 2284.7472 | -106.1664 | 62.1669 |
| Bottom | 0.658 | 202] 1.5 [DL + RSX] | 2327.2597 | 105.1743 | -35.4945 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1881.6143 | 75.3041 | -32.6408 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1924.1267 | 38.4782 | -33.1592 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2292.4513 | -45.6376 | 7 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2292.4513 | 75.3041 | 7.41 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2334.9637 | -61.6199 | 7.34 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2334.9637 | 38.4782 | 7.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.705 | 202] 1.5 [DL + RSX] | 2547.5871 | -105.8661 | 63.5942 |
| Bottom | 0.703 | 202] 1.5 [DL + RSX] | 2590.0995 | 104.9711 | -37.9298 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2097.2962 | 76.0082 | -33.1756 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2139.8087 | 39.3356 | -33.7179 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2547.5871 | -34.4254 | 7.55 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2547.5871 | 63.5942 | 7.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2590.0995 | -37.9298 | 7.72 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2590.0995 | 14.1318 | 7.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 202] 1.5 [DL + RSX] | 2811.0753 | -105.4986 | 64.7799 |
| Bottom | 0.708 | 202] 1.5 [DL + RSX] | 2853.5877 | 104.6946 | -39.9741 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2311.5181 | 76.1407 | -33.6811 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2354.0305 | 40.6195 | -34.2114 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2811.0753 | -36.0445 | 8.31 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2811.0753 | 64.7799 | 8.71 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2853.5877 | -39.9741 | 8.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2853.5877 | 16.0305 | 8.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.753 | 202] 1.5 [DL + RSX] | 3074.9075 | -104.9962 | 65.4081 |
| Bottom | 0.751 | 202] 1.5 [DL + RSX] | 3117.4199 | 104.3153 | -41.8225 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2523.9823 | 75.8998 | -34.0287 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2566.4947 | 42.5755 | -34.513 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3074.9075 | -36.72 | 9.05 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3074.9075 | 65.4081 | 9.45 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3117.4199 | -41.8225 | 9.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3117.4199 | 18.5026 | 8.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.816 | 202] 1.5 [DL + RSX] | 3338.821 | -104.2922 | 65.2199 |
| Bottom | 0.818 | 202] 1.5 [DL + RSX] | 3381.3334 | 103.7938 | -43.5721 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2734.3602 | 75.823 | -33.902 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2776.8726 | 45.9006 | -34.3168 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3338.821 | -35.8176 | 9.77 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3338.821 | 65.2199 | 10.18 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3381.3334 | -43.5721 | 10 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3381.3334 | 23.4432 | 9.72 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.862 | 202] 1.5 [DL + RSX] | 3602.5716 | -103.2811 | 64.9868 |
| Bottom | 0.868 | 202] 1.5 [DL + RSX] | 3645.084 | 102.8077 | -57.2842 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2942.3184 | 77.5703 | -37.1266 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2984.8309 | 39.9371 | -37.4613 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3602.5716 | -31.987 | 10.45 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3602.5716 | 64.9868 | 10.91 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3645.084 | -57.2842 | 10.92 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3645.084 | 21.637 | 10.43 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.885 | 202] 1.5 [DL + RSX] | 3865.7326 | -102.5499 | 52.6492 |
| Bottom | 0.898 | 202] 1.5 [DL + RSX] | 3908.245 | 101.794 | -99.8904 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3147.4604 | 70.2463 | -46.499 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3189.9729 | 21.7432 | -46.748 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3865.7326 | -35.7911 | 11.24 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3865.7326 | 52.6492 | 11.47 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3908.245 | -99.8904 | 12.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3908.245 | 8.1961 | 10.97 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.933 | 202] 1.5 [DL + RSX] | 4125.4922 | -101.9244 | -59.5123 |
| Bottom | 0.992 | 202] 1.5 [DL + RSX] | 4168.0046 | 106.3741 | 279.0587 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3347.5645 | 32.6211 | 103.4197 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3390.0769 | 291.8357 | 103.5262 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4125.4922 | -59.5123 | 12.29 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4125.4922 | 10.2251 | 11.6 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4168.0046 | 279.0587 | 15.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.95 | 202] 1.5 [DL + RSX] | 4417.0829 | -170.4491 | -755.7248 |
| Bottom | 0.825 | 202] 1.5 [DL + RSX] | 4477.3089 | 162.1848 | -127.7861 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3562.2384 | -568.2311 | 220.2662 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3622.4644 | 85.7231 | 220.5381 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4417.0829 | -545.5231 | 12.44 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4477.3089 | -127.7861 | 9.66 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4477.3089 | 44.3731 | 9.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.836 | 202] 1.5 [DL + RSX] | 4727.9704 | -156.7539 | -68.8043 |
| Bottom | 0.852 | 202] 1.5 [DL + RSX] | 4788.1963 | 158.6207 | 101.0179 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3778.3843 | 66.7375 | 50.9819 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3838.6103 | 158.9943 | 51.3576 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4727.9704 | -68.8043 | 9.75 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4727.9704 | 25.8301 | 9.45 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4788.1963 | -38.6338 | 9.66 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4788.1963 | 101.0179 | 10.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.876 | 202] 1.5 [DL + RSX] | 5038.2659 | -153.4197 | 109.2141 |
| Bottom | 0.884 | 202] 1.5 [DL + RSX] | 5098.4919 | 155.2469 | -72.3815 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3993.2182 | 149.9197 | -56.7499 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4053.4442 | 128.459 | -57.3452 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5038.2659 | -1.2937 | 9.89 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5038.2659 | 109.2141 | 10.63 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5098.4919 | -72.3815 | 10.5 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5098.4919 | 62.3301 | 10.43 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.91 | 202] 1.5 [DL + RSX] | 5347.7443 | -149.504 | 77.7381 |
| Bottom | 0.921 | 202] 1.5 [DL + RSX] | 5407.9702 | 151.5549 | -81.3168 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4205.9447 | 115.1842 | -49.7479 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4266.1706 | 127.483 | -50.524 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5347.7443 | -35.3074 | 10.73 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5347.7443 | 77.7381 | 11.02 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5407.9702 | -81.3168 | 11.17 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5407.9702 | 55.2311 | 10.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 202] 1.5 [DL + RSX] | 5655.4378 | -145.2716 | 67.8514 |
| Bottom | 0.958 | 202] 1.5 [DL + RSX] | 5715.6638 | 147.822 | -84.4014 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4416.2666 | 101.9983 | -47.1468 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4476.4926 | 138.1438 | -48.0369 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5655.4378 | -38.3224 | 11.35 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5655.4378 | 67.8514 | 11.56 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5715.6638 | -84.4014 | 11.79 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5715.6638 | 61.8116 | 11.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.978 | 202] 1.5 [DL + RSX] | 5960.8227 | -139.9009 | 63.7476 |
| Bottom | 0.994 | 202] 1.5 [DL + RSX] | 6021.0487 | 143.2538 | -93.2919 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4624.6455 | 97.9551 | -47.4034 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4684.8715 | 151.2747 | -48.3269 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5960.8227 | -27.558 | 11.88 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5960.8227 | 63.7476 | 12.13 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6021.0487 | -93.2919 | 12.45 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6021.0487 | 73.059 | 12.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.01 | 202] 1.5 [DL + RSX] | 6263.1776 | -133.5008 | 56.2946 |
| Bottom | 1.031 | 202] 1.5 [DL + RSX] | 6323.4035 | 138.0928 | -111.5319 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4831.7545 | 98.2067 | -48.1399 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4891.9804 | 166.3041 | -49.0096 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6263.1776 | -13.7319 | 12.38 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6263.1776 | 56.2946 | 12.67 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6323.4035 | -111.5319 | 13.17 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6323.4035 | 88.6553 | 13.01 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.038 | 202] 1.5 [DL + RSX] | 6561.4218 | -125.0768 | 50.5792 |
| Bottom | 1.064 | 202] 1.5 [DL + RSX] | 6621.6477 | 129.3723 | -134.7035 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5038.396 | 107.4829 | -46.6698 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5098.622 | 196.1565 | -47.4044 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6561.4218 | -6.0447 | 12.91 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6561.4218 | 50.5792 | 13.22 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6621.6477 | -134.7035 | 13.92 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6621.6477 | 122.4509 | 13.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.075 | 202] 1.5 [DL + RSX] | 6854.3142 | -118.7676 | 78.2265 |
| Bottom | 1.126 | 202] 1.5 [DL + RSX] | 6916.4521 | 138.7207 | 250.8108 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5245.5105 | 140.6785 | 54.4793 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5307.6484 | 325.477 | 55.0073 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6854.3142 | -17.7807 | 13.56 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6854.3142 | 78.2265 | 13.98 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6916.4521 | -122.6553 | 14.41 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6417.9534 | 325.477 | 14.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.368 | 202] 1.5 [DL + RSX] | 7324.6549 | -275.683 | -216.0994 |
| Bottom | 1.414 | 202] 1.5 [DL + RSX] | 7404.9562 | 278.0439 | 425.1997 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5108.5622 | -47.9648 | 110.858 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5188.8635 | 425.1997 | 110.9077 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7324.6549 | -47.9648 | 14.69 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6787.777 | 2.6602 | 13.33 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7404.9562 | -183.4891 | 15.79 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7404.9562 | 425.1997 | 17.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.387 | 202] 1.5 [DL + RSX] | 7823.7896 | -240.9519 | -310.3778 |
| Bottom | 1.427 | 202] 1.5 [DL + RSX] | 7900.6494 | 243.0221 | 488.4375 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5515.55 | 106.1076 | 93.6095 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5592.4098 | 488.4375 | 93.6179 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7823.7896 | -310.3778 | 17.49 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7823.7896 | 106.1076 | 16.08 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7900.6494 | -384.6595 | 18.15 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7900.6494 | 488.4375 | 18.87 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.065 | 206] [0.9 DL + 1.5 RSX] | 808.6502 | 141.9691 | -158.6428 |
| Bottom | 0.843 | 206] [0.9 DL + 1.5 RSX] | 834.1576 | -136.8904 | -38.3992 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1471.0773 | -76.3083 | 116.5542 | 125.6185 | 385.4446 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1513.5897 | 75.4154 | 116.9812 | 126.6716 | 386.4977 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1644.1906 | -145.3398 | 6.59 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1686.703 | -41.8832 | 5.27 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1686.703 | 24.4632 | 5.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.82 | 206] [0.9 DL + 1.5 RSX] | 888.9422 | 133.1137 | 84.695 |
| Bottom | 0.786 | 202] 1.5 [DL + RSX] | 1906.262 | -156.6544 | -75.5691 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1674.7247 | 176.1497 | -92.0107 | 130.6631 | 390.4892 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1717.2372 | 36.1445 | -92.479 | 131.7162 | 391.5423 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1766.14 | -15.4491 | 5.12 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1863.7496 | 116.8351 | 6.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1906.262 | -75.5691 | 6.34 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1808.6524 | 36.1445 | 5.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.813 | 202] 1.5 [DL + RSX] | 2090.5611 | 159.3545 | 83.2266 |
| Bottom | 0.803 | 202] 1.5 [DL + RSX] | 2133.0735 | -158.1139 | -69.3392 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1870.9035 | 142.4462 | -79.8394 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1913.4159 | 45.5676 | -80.266 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1959.5991 | -58.0943 | 6.25 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2090.5611 | 83.2266 | 6.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2133.0735 | -15.0138 | 6.13 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2002.1115 | 45.5676 | 6.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.836 | 202] 1.5 [DL + RSX] | 2322.9091 | 159.1941 | 89.1248 |
| Bottom | 0.831 | 202] 1.5 [DL + RSX] | 2365.4215 | -158.228 | -69.1751 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2057.1779 | 146.7524 | -80.9933 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2099.6904 | 48.6547 | -81.4257 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2173.8929 | -56.3176 | 6.82 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2322.9091 | 89.1248 | 7.69 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2365.4215 | -13.7739 | 6.76 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2216.4054 | 48.6547 | 6.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.815 | 202] 1.5 [DL + RSX] | 2561.2585 | 159.2171 | 89.3045 |
| Bottom | 0.811 | 202] 1.5 [DL + RSX] | 2603.771 | -158.2445 | -69.668 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2241.6856 | 146.0332 | -80.5158 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2284.198 | 51.4737 | -80.9592 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2561.2585 | -2.3674 | 7.15 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2561.2585 | 89.3045 | 8.35 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2603.771 | -11.2821 | 7.39 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2444.6046 | 51.4737 | 7.51 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.846 | 202] 1.5 [DL + RSX] | 2805.9119 | 158.9549 | 89.3353 |
| Bottom | 0.842 | 202] 1.5 [DL + RSX] | 2848.4244 | -158.0227 | -70.3668 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2428.9685 | 145.2334 | -80.0803 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2471.4809 | 54.4079 | -80.5284 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2805.9119 | -5.5399 | 7.87 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2805.9119 | 89.3353 | 9.03 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2848.4244 | -8.2126 | 8.03 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2682.7073 | 54.4079 | 8.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 202] 1.5 [DL + RSX] | 3057.3577 | 158.4102 | 89.0882 |
| Bottom | 0.875 | 202] 1.5 [DL + RSX] | 3099.8701 | -157.5414 | -70.9877 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2620.7614 | 143.8991 | -79.5573 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2663.2739 | 57.7457 | -79.9928 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3057.3577 | -8.417 | 8.61 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3057.3577 | 89.0882 | 9.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3099.8701 | -4.8317 | 8.68 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2929.8447 | 57.7457 | 8.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.915 | 202] 1.5 [DL + RSX] | 3316.1483 | 157.5233 | 88.3598 |
| Bottom | 0.916 | 202] 1.5 [DL + RSX] | 3358.6608 | -156.7428 | -71.7157 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2817.8349 | 141.9802 | -78.8655 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2860.3473 | 61.4907 | -79.2695 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3316.1483 | -10.7501 | 9.36 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3316.1483 | 88.3598 | 10.44 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3358.6608 | -0.993 | 9.34 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3186.2087 | 61.4907 | 9.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.955 | 202] 1.5 [DL + RSX] | 3582.925 | 156.2702 | 86.8049 |
| Bottom | 0.957 | 202] 1.5 [DL + RSX] | 3625.4375 | -155.6135 | -73.2236 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3020.7222 | 139.5846 | -78.0034 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3063.2346 | 65.3233 | -78.3629 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3582.925 | -12.2513 | 10.12 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3582.925 | 86.8049 | 11.16 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3625.4375 | -73.2236 | 11.09 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3625.4375 | 3.5904 | 10.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.995 | 202] 1.5 [DL + RSX] | 3858.4048 | 154.5555 | 83.7808 |
| Bottom | 0.998 | 202] 1.5 [DL + RSX] | 3900.9172 | -154.1493 | -71.7419 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3229.9477 | 136.6907 | -75.493 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3272.4602 | 73.7563 | -75.8042 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3858.4048 | -12.7331 | 10.89 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3858.4048 | 83.7808 | 11.88 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3900.9172 | -71.7419 | 11.83 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3900.9172 | 14.1294 | 11.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.036 | 202] 1.5 [DL + RSX] | 4143.2329 | 151.8425 | 83.7045 |
| Bottom | 1.053 | 202] 1.5 [DL + RSX] | 4185.7453 | -151.8438 | -121.6712 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3445.801 | 138.6388 | -89.412 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3488.3135 | 28.7984 | -89.6915 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4143.2329 | -6.271 | 11.6 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4143.2329 | 83.7045 | 12.67 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4185.7453 | -24.3722 | 11.97 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4017.2729 | 28.7984 | 11.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.068 | 202] 1.5 [DL + RSX] | 4439.1694 | 148.4388 | -56.5712 |
| Bottom | 1.131 | 202] 1.5 [DL + RSX] | 4481.6819 | -148.5163 | 268.9087 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3670.0608 | 85.8182 | 133.6868 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3712.5732 | 341.6431 | 133.818 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4439.1694 | -56.5712 | 13.12 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4439.1694 | 24.8335 | 12.68 | 6 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2712.4759 | -15.5595 | 7.75 | 6 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4481.6819 | 268.9087 | 16.18 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.093 | 202] 1.5 [DL + RSX] | 4723.3442 | 212.426 | -865.6779 |
| Bottom | 0.932 | 202] 1.5 [DL + RSX] | 4783.5701 | -205.3074 | 117.1546 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3903.6897 | -563.5317 | 345.0394 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3963.9157 | 220.0612 | 345.0706 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4723.3442 | -606.5038 | 13.46 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4783.5701 | -25.1641 | 9.55 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4783.5701 | 117.1546 | 10.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.932 | 202] 1.5 [DL + RSX] | 5016.6744 | 188.9941 | 113.9804 |
| Bottom | 0.936 | 202] 1.5 [DL + RSX] | 5076.9003 | -192.2127 | 65.2573 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4156.6942 | 188.9722 | -88.9285 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4216.9201 | 179.179 | -89.3694 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4890.4118 | -55.0127 | 9.97 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5016.6744 | 113.9804 | 10.63 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5076.9003 | -59.2007 | 10.36 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5076.9003 | 65.2573 | 10.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.959 | 202] 1.5 [DL + RSX] | 5316.6013 | 188.6861 | 71.5269 |
| Bottom | 0.967 | 202] 1.5 [DL + RSX] | 5376.8273 | -189.7195 | -65.0269 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4415.1571 | 143.5314 | -77.2489 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4475.3831 | 171.107 | -77.8315 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5316.6013 | -27.4048 | 10.61 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5316.6013 | 71.5269 | 10.92 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5376.8273 | -65.0269 | 10.99 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5376.8273 | 50.2712 | 10.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.988 | 202] 1.5 [DL + RSX] | 5623.8516 | 183.0353 | 56.3891 |
| Bottom | 0.998 | 202] 1.5 [DL + RSX] | 5684.0776 | -184.9136 | -58.282 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4680.1427 | 119.8072 | -69.5725 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4740.3686 | 181.6483 | -70.2714 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5623.8516 | -45.036 | 11.34 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5623.8516 | 56.3891 | 11.42 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5684.0776 | -58.282 | 11.55 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5684.0776 | 54.8965 | 11.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.021 | 202] 1.5 [DL + RSX] | 5938.9009 | 176.6199 | 52.67 |
| Bottom | 1.033 | 202] 1.5 [DL + RSX] | 5999.1268 | -179.1126 | 61.0839 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4952.601 | 104.8756 | -66.1069 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5012.827 | 193.2962 | -66.88 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5938.9009 | -44.636 | 11.95 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5938.9009 | 52.67 | 12.01 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5999.1268 | -55.6747 | 12.15 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5999.1268 | 61.0839 | 12.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 202] 1.5 [DL + RSX] | 6262.3465 | 168.8943 | 44.7794 |
| Bottom | 1.068 | 202] 1.5 [DL + RSX] | 6322.5725 | -172.1064 | 70.9589 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5233.6689 | 84.7522 | 65.4116 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5293.8949 | 208.6119 | 66.2018 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6262.3465 | -43.0663 | 12.58 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6262.3465 | 44.7794 | 12.59 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6322.5725 | -56.233 | 12.79 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6322.5725 | 70.9589 | 12.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.084 | 202] 1.5 [DL + RSX] | 6594.9913 | 159.6791 | -39.2458 |
| Bottom | 1.104 | 202] 1.5 [DL + RSX] | 6655.2172 | -164.0732 | 86.9646 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5524.9212 | 64.7124 | 65.8222 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5585.1471 | 230.3593 | 66.56 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6595.886 | -69.6128 | 13.41 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6595.886 | 64.7124 | 13.38 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6656.112 | -202.855 | 14.46 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6656.112 | 230.3593 | 14.65 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.113 | 202] 1.5 [DL + RSX] | 6937.7898 | 147.5954 | -33.7354 |
| Bottom | 1.138 | 202] 1.5 [DL + RSX] | 6998.0157 | -152.2631 | 106.4843 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5828.4053 | 58.8407 | 64.3212 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5888.6312 | 255.3244 | 64.9456 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6965.6737 | -67.703 | 14.13 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6965.6737 | 58.8407 | 14.07 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6998.0157 | -76.9673 | 14.25 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6998.0157 | 106.4843 | 14.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.148 | 202] 1.5 [DL + RSX] | 7291.0479 | 135.9809 | -47.2742 |
| Bottom | 1.188 | 202] 1.5 [DL + RSX] | 7353.1858 | -151.3537 | 127.5665 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6145.8525 | 77.1699 | 56.9048 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6207.9904 | 274.1945 | 57.3861 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7344.7472 | -101.9555 | 15.11 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7344.7472 | 77.1699 | 14.94 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7406.8851 | -244.3733 | 16.21 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7406.8851 | 274.1945 | 16.42 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.39 | 202] 1.5 [DL + RSX] | 7676.539 | 300.6541 | -80.4853 |
| Bottom | 1.428 | 202] 1.5 [DL + RSX] | 7756.8403 | 303.015 | 227.2763 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6501.5543 | 103.2723 | 61.9897 | 222.2736 | 590.3606 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6581.8556 | 382.6093 | 62.3019 | 222.2736 | 590.3606 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7752.2092 | -152.3396 | 16.25 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7752.2092 | 103.2723 | 15.92 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7832.5105 | -313.8093 | 17.53 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7832.5105 | 382.6093 | 18.01 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.405 | 202] 1.5 [DL + RSX] | 8152.8331 | 266.2934 | -171.9936 |
| Bottom | 1.44 | 202] 1.5 [DL + RSX] | 8229.6929 | 268.3635 | 310.1154 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6978.0057 | 171.4103 | 81.0922 | 222.2736 | 590.3606 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7054.8655 | 505.3247 | 81.147 | 222.2736 | 590.3606 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8232.5176 | -260.2828 | 17.94 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8232.5176 | 171.4103 | 17.33 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8309.3774 | -435.2124 | 19.3 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8309.3774 | 505.3247 | 19.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.375 | 202] 1.5 [DL + RSX] | 137.8662 | 240.0518 | 146.1901 |
| Bottom | 1.063 | 202] 1.5 [DL + RSX] | 425.1361 | 157.7245 | 473.3803 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 250.1047 | 318.3092 | 140.5582 | 412.6144 | 1678.184 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 479.9207 | 539.6348 | 157.2194 | 417.9462 | 1683.5157 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 411.4854 | -289.0966 | 0.4 | 6 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 411.4854 | 318.3092 | 0.42 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 379.1374 | -69.2098 | 0.26 | 6 |
| Botttom–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 641.3013 | 539.6348 | 0.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.451 | 206] [0.9 DL + 1.5 RSX] | 206.7866 | 59.5653 | 404.2826 |
| Bottom | 0.958 | 202] 1.5 [DL + RSX] | 593.3196 | -145.1557 | 911.6256 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 450.8261 | 735.602 | 203.5792 | 417.2712 | 1682.8407 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 628.253 | 1071.7276 | 211.25 | 421.3875 | 1686.957 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 690.4737 | -110.8451 | 0.46 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 750.4226 | 735.602 | 0.86 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 621.8997 | -108.625 | 0.42 | 6 |
| Botttom–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 931.6318 | 1071.7276 | 1.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.946 | 202] 1.5 [DL + RSX] | 673.2218 | 157.9277 | 814.6142 |
| Bottom | 1.176 | 206] [0.9 DL + 1.5 RSX] | 442.4938 | -153.3944 | 796.9903 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 657.8927 | 1133.9168 | 141.9955 | 422.0751 | 1687.6447 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 850.473 | 1413.0483 | 148.7423 | 426.543 | 1692.1125 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1162.7849 | -234.2679 | 0.8 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1162.7849 | 1200.1508 | 1.37 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1395.8452 | -130.1496 | 0.87 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1395.8452 | 1405.6149 | 1.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.297 | 206] [0.9 DL + 1.5 RSX] | 571.1105 | 191.9593 | 676.8594 |
| Bottom | 1.209 | 206] [0.9 DL + 1.5 RSX] | 672.7217 | -188.8732 | 776.4504 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 896.5791 | 1726.5557 | 225.9035 | 427.6126 | 1693.1822 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1127.263 | 1827.3026 | 232.8393 | 432.9645 | 1698.5341 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1763.3785 | -748.7753 | 1.44 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1763.3785 | 1726.5557 | 2.02 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1993.5231 | -581.8341 | 1.48 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1993.5231 | 1827.3026 | 2.21 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.121 | 206] [0.9 DL + 1.5 RSX] | 822.0499 | 200.8309 | 709.1293 |
| Bottom | 1 | 207] [0.9 DL + 1.5 RSY] | 690.6805 | -133.0382 | 1906.1947 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1290.2013 | 2205.7272 | -297.7511 | 436.7447 | 1702.3142 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1524.4905 | 2127.5352 | -303.4692 | 442.1802 | 1707.7497 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2411.3216 | -1130.4109 | 2.04 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2411.3216 | 2205.7272 | 2.67 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2644.5592 | -1020.8324 | 2.11 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2644.5592 | 2127.5352 | 2.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 206] [0.9 DL + 1.5 RSX] | 1067.8952 | 211.7248 | 639.488 |
| Bottom | 0.853 | 207] [0.9 DL + 1.5 RSY] | 869.3271 | -132.2405 | 2221.1228 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1676.2612 | 2456.3896 | -385.9908 | 445.7013 | 1711.2708 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1910.8605 | 2406.022 | -389.9139 | 451.144 | 1716.7135 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3063.1656 | -1482.215 | 2.61 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3063.1656 | 2456.3896 | 3.18 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3296.8062 | -1481.5259 | 2.75 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3296.8062 | 2406.022 | 3.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.754 | 206] [0.9 DL + 1.5 RSX] | 1306.1413 | 218.0007 | 549.8095 |
| Bottom | 0.797 | 207] [0.9 DL + 1.5 RSY] | 1039.1326 | -129.1161 | 2580.0347 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2052.0018 | 2646.1622 | -440.6635 | 454.4184 | 1719.988 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2286.7601 | 2731.5774 | -443.0385 | 459.8648 | 1725.4344 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3717.4825 | -1823.0484 | 3.19 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3717.4825 | 2646.1622 | 3.67 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3951.3776 | -1973.8635 | 3.41 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3951.3776 | 2731.5774 | 3.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.643 | 207] [0.9 DL + 1.5 RSY] | 1061.898 | 104.0035 | 2732.47 |
| Bottom | 0.689 | 207] [0.9 DL + 1.5 RSY] | 1202.9745 | -116.4796 | 2970.076 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2420.5886 | 2868.5181 | -472.9579 | 462.9697 | 1728.5392 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2655.4405 | 3091.1091 | -474.1909 | 468.4182 | 1733.9878 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4372.8642 | -2188.2774 | 3.77 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4372.8642 | 2868.5181 | 4.17 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4606.8897 | -2485.9436 | 4.08 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4606.8897 | 3091.1091 | 4.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 207] [0.9 DL + 1.5 RSY] | 1225.8427 | 113.2873 | 3000.833 |
| Bottom | 0.68 | 207] [0.9 DL + 1.5 RSY] | 1367.0015 | -118.9971 | 3322.9739 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2792.0122 | 3092.2124 | 371.8886 | 471.5867 | 1737.1562 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3027.0197 | 3452.6418 | 372.3949 | 477.0389 | 1742.6084 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5038.8351 | -2635.3154 | 4.42 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5038.8351 | 3092.2124 | 4.68 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5273.0712 | -2804.3026 | 4.65 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5273.0712 | 3452.6418 | 5.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.589 | 207] [0.9 DL + 1.5 RSY] | 1391.5169 | 106.8371 | 3352.7512 |
| Bottom | 0.62 | 207] [0.9 DL + 1.5 RSY] | 1532.7624 | -118.3167 | 3555.0988 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3166.5917 | 3447.4544 | -372.561 | 480.2769 | 1745.8465 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3401.7113 | 3656.4529 | -372.9331 | 485.7317 | 1751.3013 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5708.782 | -2973.9384 | 5 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5708.782 | 3447.4544 | 5.27 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5943.033 | -3149.6825 | 5.23 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5943.033 | 3656.4529 | 5.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.531 | 207] [0.9 DL + 1.5 RSY] | 1555.2497 | 104.6399 | 3620.2696 |
| Bottom | 0.543 | 207] [0.9 DL + 1.5 RSY] | 1696.5027 | -117.8234 | 3700.3859 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3537.849 | 3691.0615 | -380.7767 | 488.8901 | 1754.4597 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3772.9576 | 3778.771 | -381.7178 | 494.3446 | 1759.9142 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6375.1475 | -3337.1017 | 5.59 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6375.1475 | 3691.0615 | 5.8 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6609.3171 | -3386.8457 | 5.75 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6609.3171 | 3778.771 | 5.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.477 | 207] [0.9 DL + 1.5 RSY] | 1717.0107 | 102.439 | 3804.4167 |
| Bottom | 0.483 | 207] [0.9 DL + 1.5 RSY] | 1858.2336 | -116.3589 | 3757.1613 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3906.1418 | 3854.78 | -397.6127 | 497.4345 | 1763.0041 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4141.1824 | 3819.1167 | -399.3824 | 502.8874 | 1768.457 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7039.5136 | -3602.9637 | 6.12 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7039.5136 | 3854.78 | 6.27 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7273.5615 | -3509.3398 | 6.2 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7273.5615 | 3819.1167 | 6.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.44 | 203] 1.5 [DL + RSY] | 7703.0499 | 139.637 | 3933.2695 |
| Bottom | 0.456 | 203] 1.5 [DL + RSY] | 7936.9649 | -158.4182 | 3789.9371 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4270.1759 | 3933.2695 | -424.1044 | 505.8801 | 1771.4496 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4505.1172 | 3789.9371 | -426.5725 | 511.3307 | 1776.9003 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7703.0499 | -3752.522 | 6.59 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7703.0499 | 3933.2695 | 6.7 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7936.9649 | -3534.9307 | 6.6 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7936.9649 | 3789.9371 | 6.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.463 | 203] 1.5 [DL + RSY] | 8367.36 | 136.6097 | 3931.0093 |
| Bottom | 0.477 | 203] 1.5 [DL + RSY] | 8601.1404 | -155.3094 | 3716.1612 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4628.4122 | 3931.0093 | -457.5689 | 514.1912 | 1779.7607 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4863.2381 | 3716.1612 | -460.3768 | 519.6391 | 1785.2087 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8367.36 | -3795.7998 | 6.99 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8367.36 | 3931.0093 | 7.07 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8601.1404 | -3498.4869 | 6.95 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8601.1404 | 3716.1612 | 7.08 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.485 | 203] 1.5 [DL + RSY] | 9034.0777 | 133.0551 | 3865.019 |
| Bottom | 0.498 | 203] 1.5 [DL + RSY] | 9267.7235 | -151.8732 | 3635.9536 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4979.1399 | 3865.019 | -493.6366 | 522.328 | 1787.8976 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5213.8498 | 3635.9536 | -496.3771 | 527.7733 | 1793.3429 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9034.0777 | -3759.1802 | 7.35 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9034.0777 | 3865.019 | 7.41 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9267.7235 | -3445.533 | 7.3 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9267.7235 | 3635.9536 | 7.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.505 | 203] 1.5 [DL + RSY] | 9704.6267 | 128.9196 | 3765.6277 |
| Bottom | 0.52 | 203] 1.5 [DL + RSY] | 9938.1345 | -148.0812 | 3594.0545 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5320.7947 | 3765.6277 | -527.7786 | 530.2544 | 1795.824 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5555.4036 | 3594.0545 | -530.1305 | 535.6974 | 1801.2669 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9704.6267 | -3680.0842 | 7.69 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9704.6267 | 3765.6277 | 7.74 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9938.1345 | -3423.2925 | 7.67 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9938.1345 | 3594.0545 | 7.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.526 | 203] 1.5 [DL + RSY] | 10379.977 | 124.3943 | 3672.4559 |
| Bottom | 0.544 | 203] 1.5 [DL + RSY] | 10613.3403 | -143.7576 | 3629.8799 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5652.2266 | 3672.4559 | -556.0803 | 537.9437 | 1803.5132 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5886.7631 | 3629.8799 | -557.8815 | 543.3849 | 1808.9545 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10379.977 | -3600.476 | 8.03 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10379.977 | 3672.4559 | 8.07 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10613.3403 | -3466.4761 | 8.08 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10613.3403 | 3629.8799 | 8.18 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.552 | 203] 1.5 [DL + RSY] | 11060.4893 | 119.8476 | 3626.2576 |
| Bottom | 0.57 | 203] 1.5 [DL + RSY] | 11293.7029 | -138.1767 | 3766.9206 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5972.906 | 3626.2576 | -574.3643 | 545.3834 | 1810.953 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6207.4117 | 3766.9206 | -575.6405 | 550.824 | 1816.3935 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11060.4893 | -3556.3609 | 8.39 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11060.4893 | 3626.2576 | 8.43 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11293.7029 | -3579.7019 | 8.54 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11293.7029 | 3766.9206 | 8.65 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.58 | 203] 1.5 [DL + RSY] | 11745.7143 | 116.0337 | 3660.5529 |
| Bottom | 0.598 | 203] 1.5 [DL + RSY] | 11978.7683 | -127.4049 | 3978.3693 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6282.9118 | 3660.5529 | 586.9319 | 552.5756 | 1818.1451 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6517.4288 | 3978.3693 | 587.9237 | 558.0163 | 1823.5859 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11745.7143 | -3561.76 | 8.78 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11745.7143 | 3660.5529 | 8.84 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11978.7683 | -3745.793 | 9.02 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11978.7683 | 3978.3693 | 9.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.611 | 203] 1.5 [DL + RSY] | 12434.1191 | 116.6487 | 3764.2746 |
| Bottom | 0.625 | 203] 1.5 [DL + RSY] | 12667.0451 | -118.4159 | 4135.9214 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6582.5722 | 3764.2746 | -588.6137 | 559.5277 | 1825.0972 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6817.148 | 4135.9214 | -589.7803 | 564.9698 | 1830.5394 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12434.1191 | -3614.165 | 9.21 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12434.1191 | 3764.2746 | 9.29 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12667.0451 | -3923.7375 | 9.52 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12667.0451 | 4135.9214 | 9.65 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.641 | 203] 1.5 [DL + RSY] | 13128.2611 | 117.5032 | 3825.7684 |
| Bottom | 0.657 | 203] 1.5 [DL + RSY] | 13361.1705 | -125.578 | 4134.6562 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6874.9443 | 3825.7684 | -533.6699 | 566.3107 | 1831.8803 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7109.6297 | 4134.6562 | -535.451 | 571.7554 | 1837.325 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13128.2611 | -3692.9909 | 9.65 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13128.2611 | 3825.7684 | 9.73 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13361.1705 | -3971.8389 | 9.94 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13361.1705 | 4134.6562 | 10.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.663 | 203] 1.5 [DL + RSY] | 13824.6954 | 97.6324 | 3775.2734 |
| Bottom | 0.685 | 203] 1.5 [DL + RSY] | 14057.1795 | -120.791 | 4168.7033 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7160.3788 | 3775.2734 | -534.5673 | 572.9328 | 1838.5024 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7394.8697 | 4168.7033 | -536.8476 | 578.373 | 1843.9425 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13824.6954 | -3701.123 | 10.05 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13824.6954 | 3775.2734 | 10.09 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14057.1795 | -4005.91 | 10.36 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14057.1795 | 4168.7033 | 10.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.683 | 203] 1.5 [DL + RSY] | 14525.3419 | 94.0703 | 3742.4982 |
| Bottom | 0.707 | 203] 1.5 [DL + RSY] | 14757.6475 | -117.215 | 4251.327 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7441.0997 | 3742.4982 | 564.2047 | 579.4455 | 1845.0151 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7675.5155 | 4251.327 | 567.1897 | 584.884 | 1850.4535 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14525.3419 | -3679.9066 | 10.44 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14525.3419 | 3742.4982 | 10.47 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14757.6475 | -4026.5584 | 10.77 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14757.6475 | 4251.327 | 10.9 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.71 | 203] 1.5 [DL + RSY] | 15229.6403 | 89.592 | 3722.4604 |
| Bottom | 0.736 | 203] 1.5 [DL + RSY] | 15461.8136 | -113.6727 | 4372.0869 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7718.4654 | 3722.4604 | 602.5617 | 585.8804 | 1851.45 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7952.7852 | 4372.0869 | 606.1767 | 591.3166 | 1856.8862 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15229.6403 | -3612.0439 | 10.8 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15229.6403 | 3722.4604 | 10.86 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15461.8136 | -4121.4235 | 11.23 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15461.8136 | 4372.0869 | 11.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 203] 1.5 [DL + RSY] | 15935.7211 | 84.0222 | 3700.5489 |
| Bottom | 0.767 | 203] 1.5 [DL + RSY] | 16167.7942 | -109.0702 | 4615.8298 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7993.9752 | 3700.5489 | -652.9336 | 592.2722 | 1857.8418 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8228.1774 | 4615.8298 | -656.8667 | 597.7057 | 1863.2753 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15935.7211 | -3578.2504 | 11.18 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15935.7211 | 3700.5489 | 11.25 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16167.7942 | -4381.2437 | 11.79 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16167.7942 | 4615.8298 | 11.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.765 | 203] 1.5 [DL + RSY] | 16640.887 | 78.2443 | 3779.012 |
| Bottom | 0.799 | 203] 1.5 [DL + RSY] | 16872.9006 | -103.3923 | 5082.9386 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8270.5321 | 3779.012 | -713.799 | 598.6883 | 1864.2579 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8504.5978 | 5082.9386 | -717.6561 | 604.1187 | 1869.6882 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16640.887 | -3688.4609 | 11.65 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16640.887 | 3779.012 | 11.7 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16872.9006 | -4912.2979 | 12.5 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16872.9006 | 5082.9386 | 12.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.781 | 203] 1.5 [DL + RSY] | 17341.1531 | 72.0421 | 4107.4069 |
| Bottom | 0.819 | 203] 1.5 [DL + RSY] | 17573.148 | -96.176 | 5842.4291 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8552.6007 | 4107.4069 | -776.8575 | 605.2323 | 1870.8019 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8786.5069 | 5842.4291 | -780.2747 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17341.1531 | -4099.2753 | 12.29 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17341.1531 | 4107.4069 | 12.29 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17573.148 | -5802.2761 | 13.42 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17573.148 | 5842.4291 | 13.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.815 | 203] 1.5 [DL + RSY] | 18030.9327 | 65.7841 | -4950.3047 |
| Bottom | 0.857 | 203] 1.5 [DL + RSY] | 18262.9295 | -85.3026 | -7087.132 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8846.5334 | 4805.433 | -835.5291 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9080.2289 | 6942.4616 | -838.234 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18030.9327 | -4950.3047 | 13.18 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 18030.9327 | 4805.433 | 13.1 | 6 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18262.9295 | -7087.132 | 14.56 | 6 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18262.9295 | 6942.4616 | 14.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.857 | 203] 1.5 [DL + RSY] | 18702.4652 | 60.5805 | -6295.6381 |
| Bottom | 0.909 | 203] 1.5 [DL + RSY] | 18941.2488 | -64.2246 | -8813.4638 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9160.8519 | 5937.3607 | 880.4915 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9400.937 | 8601.8807 | 882.3957 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18702.4652 | -6295.6381 | 14.35 | 6 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18702.4652 | 5937.3607 | 14.14 | 6 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18941.2488 | -8813.4638 | 15.96 | 6 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18941.2488 | 8601.8807 | 15.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.161 | 203] 1.5 [DL + RSY] | 19435.9037 | 592.2424 | 7986.3397 |
| Bottom | 1.276 | 203] 1.5 [DL + RSY] | 19737.2896 | -601.1031 | -11624.9254 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9634.3858 | 7986.3397 | -998.4821 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9936.5719 | 11620.4804 | -999.6928 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 19435.9037 | -7688.2161 | 15.58 | 6 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 19435.9037 | 7986.3397 | 15.76 | 6 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19737.2896 | -11624.9254 | 18.06 | 6 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19737.2896 | 11620.4804 | 18.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.259 | 203] 1.5 [DL + RSY] | 20149.0931 | 570.7214 | 11371.0905 |
| Bottom | 1.377 | 203] 1.5 [DL + RSY] | 20438.8413 | 578.5255 | 15202.5523 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10187.4034 | 11371.0905 | 961.6014 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10477.4376 | 15202.5523 | 961.8143 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 20149.0931 | -10778.9802 | 17.8 | 6 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 20149.0931 | 11371.0905 | 18.15 | 6 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 20438.8413 | -13944.3693 | 19.82 | 6 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20438.8413 | 15202.5523 | 20.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.661 | 204] 1.2 [DL + LL + RSX] | 218.2848 | -276.6649 | 241.3491 |
| Bottom | 1.405 | 202] 1.5 [DL + RSX] | 398.2152 | 235.4057 | -254.2176 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 50.9322 | 507.4396 | -137.8442 | 407.9936 | 1673.5632 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 338.2022 | 171.5915 | -160.093 | 414.6583 | 1680.2279 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 331.4501 | -137.9508 | 0.27 | 6 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 331.4501 | 491.9452 | 0.48 | 6 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 561.2661 | -46.5211 | 0.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 561.2661 | 304.2398 | 0.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.485 | 202] 1.5 [DL + RSX] | 489.8516 | -221.7886 | 513.4771 |
| Bottom | 1.55 | 202] 1.5 [DL + RSX] | 680.4202 | 258.4543 | 490.9351 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 371.2489 | 722.9459 | -268.4098 | 415.425 | 1680.9945 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 595.4425 | 591.1909 | -279.5449 | 420.6263 | 1686.1958 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 790.1022 | -120.9654 | 0.52 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 831.2916 | 758.3907 | 0.92 | 6 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1014.3703 | -11.2699 | 0.59 | 6 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1014.3703 | 701.5553 | 0.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.284 | 202] 1.5 [DL + RSX] | 871.7674 | -234.3502 | 588.2417 |
| Bottom | 0.967 | 206] [0.9 DL + 1.5 RSX] | 573.9153 | 162.6143 | 497.3291 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 690.9436 | 871.1658 | -144.9559 | 422.8419 | 1688.4115 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 930.2206 | 817.4144 | -154.6594 | 428.3931 | 1693.9627 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1387.6846 | -154.4247 | 0.88 | 6 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1387.6846 | 853.5797 | 1.29 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1610.7872 | -493.9395 | 1.21 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1610.7872 | 817.4144 | 1.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.13 | 206] [0.9 DL + 1.5 RSX] | 688.3296 | -200.228 | 470.0169 |
| Bottom | 1.062 | 206] [0.9 DL + 1.5 RSX] | 791.3805 | 197.8976 | 555.5456 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1045.802 | 1192.2207 | 224.8034 | 431.0746 | 1696.6442 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1273.8727 | 1387.278 | 231.7567 | 436.3658 | 1701.9354 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1951.9593 | -991.4165 | 1.69 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1951.9593 | 1192.2207 | 1.81 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2180.566 | -822.4274 | 1.73 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2180.566 | 1387.278 | 2.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.046 | 206] [0.9 DL + 1.5 RSX] | 928.2772 | -211.2596 | 573.8285 |
| Bottom | 0.96 | 207] [0.9 DL + 1.5 RSY] | 762.1419 | 143.7179 | 1723.8946 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1422.9858 | 1841.0109 | 268.8915 | 439.8253 | 1705.3948 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1654.0262 | 1861.6458 | 274.5133 | 445.1854 | 1710.755 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2573.3092 | -1286.6359 | 2.22 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2573.3092 | 1841.0109 | 2.55 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2805.3951 | -1172.8901 | 2.29 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2805.3951 | 1861.6458 | 2.69 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.918 | 206] [0.9 DL + 1.5 RSX] | 1165.8386 | -222.8861 | 568.8473 |
| Bottom | 0.863 | 207] [0.9 DL + 1.5 RSY] | 933.88 | 143.5402 | 2111.5031 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1794.9691 | 2267.6521 | -371.8336 | 448.4553 | 1714.0248 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2025.6993 | 2244.1715 | -375.8719 | 453.8082 | 1719.3778 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3201.7141 | -1569.4594 | 2.74 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3201.7141 | 2267.6521 | 3.15 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3433.3971 | -1580.8297 | 2.88 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3433.3971 | 2244.1715 | 3.27 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.756 | 206] [0.9 DL + 1.5 RSX] | 1397.4242 | -229.0001 | 521.6069 |
| Bottom | 0.823 | 207] [0.9 DL + 1.5 RSY] | 1097.4568 | 140.986 | 2509.0476 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2157.6129 | 2562.328 | -443.6769 | 456.8686 | 1722.4382 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2388.1832 | 2623.8896 | -446.14 | 462.2179 | 1727.7874 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3834.0195 | -1867.1702 | 3.28 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3834.0195 | 2562.328 | 3.69 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4065.4489 | -2049.6799 | 3.52 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4065.4489 | 2623.8896 | 3.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.689 | 207] [0.9 DL + 1.5 RSY] | 1117.2519 | -116.9389 | 2711.5917 |
| Bottom | 0.725 | 207] [0.9 DL + 1.5 RSY] | 1255.3718 | 128.6894 | 2919.4205 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2513.7874 | 2836.1429 | -485.9266 | 465.1319 | 1730.7014 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2744.2624 | 3009.4915 | -487.2103 | 470.4789 | 1736.0485 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4468.8902 | -2213.3872 | 3.84 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4468.8902 | 2836.1429 | 4.21 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4700.1908 | -2559.1362 | 4.18 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4700.1908 | 3009.4915 | 4.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.711 | 207] [0.9 DL + 1.5 RSY] | 1276.3017 | -126.0133 | 2995.6645 |
| Bottom | 0.722 | 207] [0.9 DL + 1.5 RSY] | 1414.3383 | 131.1488 | 3286.088 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2874.6733 | 3079.604 | -364.3751 | 473.5044 | 1739.074 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3104.9918 | 3389.7574 | -364.8699 | 478.8478 | 1744.4174 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5117.1849 | -2659.9062 | 4.48 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5117.1849 | 3079.604 | 4.72 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5348.2759 | -2871.41 | 4.73 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5348.2759 | 3389.7574 | 5.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.648 | 207] [0.9 DL + 1.5 RSY] | 1437.3625 | -119.9708 | 3358.2043 |
| Bottom | 0.67 | 207] [0.9 DL + 1.5 RSY] | 1575.3118 | 130.9911 | 3529.7358 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3239.3872 | 3449.0891 | -383.0257 | 481.9658 | 1747.5353 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3469.593 | 3610.9837 | -383.428 | 487.3066 | 1752.8761 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5770.7363 | -2994.6651 | 5.04 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5770.7363 | 3449.0891 | 5.31 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6001.813 | -3204.7442 | 5.3 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6001.813 | 3610.9837 | 5.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.592 | 207] [0.9 DL + 1.5 RSY] | 1596.5045 | -117.5348 | 3634.5646 |
| Bottom | 0.597 | 207] [0.9 DL + 1.5 RSY] | 1734.4452 | 130.5575 | 3682.1848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3601.1654 | 3706.2043 | -391.6442 | 490.359 | 1755.9286 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3831.3812 | 3745.6305 | -392.6375 | 495.7 | 1761.2696 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6422.1393 | -3348.006 | 5.62 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6422.1393 | 3706.2043 | 5.83 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6653.2984 | -3428.4021 | 5.8 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 6653.2984 | 3745.6305 | 5.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.518 | 207] [0.9 DL + 1.5 RSY] | 1753.7715 | -115.1217 | 3823.0718 |
| Bottom | 0.52 | 207] [0.9 DL + 1.5 RSY] | 1891.7412 | 129.0223 | 3740.477 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3960.4485 | 3878.2791 | -410.1798 | 498.6944 | 1764.264 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4190.7312 | 3790.551 | -412.0103 | 504.037 | 1769.6065 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7072.9368 | -3602.2426 | 6.14 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7072.9368 | 3878.2791 | 6.3 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7304.2187 | -3540.1813 | 6.24 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7304.2187 | 3790.551 | 6.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.48 | 207] [0.9 DL + 1.5 RSY] | 1907.9126 | -112.9571 | 3914.3832 |
| Bottom | 0.465 | 203] 1.5 [DL + RSY] | 7955.6341 | 175.3247 | 3761.5155 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4315.9453 | 3957.3304 | -437.9433 | 506.9419 | 1772.5115 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4546.3263 | 3761.5155 | -440.4636 | 512.2868 | 1777.8563 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7724.2184 | -3742.5946 | 6.6 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7724.2184 | 3957.3304 | 6.72 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7955.6341 | -3557.7514 | 6.62 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7955.6341 | 3761.5155 | 6.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.473 | 203] 1.5 [DL + RSY] | 8377.5024 | -152.7244 | 3950.8884 |
| Bottom | 0.486 | 203] 1.5 [DL + RSY] | 8609.0535 | 171.8505 | 3687.178 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4666.1358 | 3950.8884 | -472.0118 | 515.0664 | 1780.6359 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4896.6316 | 3687.178 | -474.8494 | 520.4139 | 1785.9834 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8377.5024 | -3778.9484 | 6.99 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8377.5024 | 3950.8884 | 7.09 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8609.0535 | -3516.7202 | 6.97 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8609.0535 | 3687.178 | 7.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.493 | 203] 1.5 [DL + RSY] | 9034.3395 | -148.5942 | 3879.4469 |
| Bottom | 0.506 | 203] 1.5 [DL + RSY] | 9266.0256 | 168.0504 | 3608.6402 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5009.3447 | 3879.4469 | -507.92 | 523.0288 | 1788.5984 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5239.9561 | 3608.6402 | -510.663 | 528.379 | 1793.9485 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9034.3395 | -3738.3294 | 7.34 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9034.3395 | 3879.4469 | 7.42 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9266.0256 | -3463.9582 | 7.31 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9266.0256 | 3608.6402 | 7.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.513 | 203] 1.5 [DL + RSY] | 9696.0657 | -143.886 | 3776.2718 |
| Bottom | 0.528 | 203] 1.5 [DL + RSY] | 9927.89 | 163.8847 | 3571.8288 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5344.0496 | 3776.2718 | -541.1836 | 530.794 | 1796.3635 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5574.7618 | 3571.8288 | -543.5156 | 536.1465 | 1801.716 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9696.0657 | -3659.569 | 7.67 | 6 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9696.0657 | 3776.2718 | 7.74 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9927.89 | -3447.2267 | 7.68 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9927.89 | 3571.8288 | 7.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.533 | 203] 1.5 [DL + RSY] | 10363.5668 | -138.8198 | 3682.6066 |
| Bottom | 0.551 | 203] 1.5 [DL + RSY] | 10595.5357 | 159.1325 | 3614.6722 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5669.1403 | 3682.6066 | -568.1816 | 538.3361 | 1803.9056 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5899.9247 | 3614.6722 | -569.9521 | 543.6903 | 1809.2598 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10363.5668 | -3585.6422 | 8.01 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10363.5668 | 3682.6066 | 8.07 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10595.5357 | -3499.9242 | 8.09 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10595.5357 | 3614.6722 | 8.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.556 | 203] 1.5 [DL + RSY] | 11037.1293 | -133.8138 | 3638.4957 |
| Bottom | 0.575 | 203] 1.5 [DL + RSY] | 11269.2479 | 153.0295 | 3756.9198 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5984.1173 | 3638.4957 | -585.2724 | 545.6435 | 1811.2131 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6214.9324 | 3756.9198 | -586.5231 | 550.9984 | 1816.568 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11037.1293 | -3552.031 | 8.37 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11037.1293 | 3638.4957 | 8.42 | 6 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11269.2479 | -3624.0122 | 8.55 | 6 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11269.2479 | 3756.9198 | 8.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.584 | 203] 1.5 [DL + RSY] | 11716.252 | -129.6365 | 3674.043 |
| Bottom | 0.601 | 203] 1.5 [DL + RSY] | 11948.5305 | 141.5752 | 3969.1467 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6289.0786 | 3674.043 | -594.4114 | 552.7186 | 1818.2882 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6519.8824 | 3969.1467 | -595.3867 | 558.0733 | 1823.6428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11716.252 | -3570.5867 | 8.77 | 6 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 11716.252 | 3674.043 | 8.83 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11948.5305 | -3798.8606 | 9.04 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11948.5305 | 3969.1467 | 9.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.614 | 203] 1.5 [DL + RSY] | 12399.3766 | -129.8978 | 3775.1224 |
| Bottom | 0.628 | 203] 1.5 [DL + RSY] | 12631.7831 | 130.9852 | 4130.9693 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6584.4088 | 3775.1224 | -593.8859 | 559.5703 | 1825.1398 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6815.1536 | 4130.9693 | -595.0669 | 564.9236 | 1830.4931 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12399.3766 | -3635.0126 | 9.2 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12399.3766 | 3775.1224 | 9.28 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12631.7831 | -3972.3466 | 9.53 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12631.7831 | 4130.9693 | 9.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.644 | 203] 1.5 [DL + RSY] | 13088.8301 | -130.4228 | 3838.7093 |
| Bottom | 0.66 | 203] 1.5 [DL + RSY] | 13321.2532 | 138.8751 | 4146.9848 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6873.088 | 3838.7093 | -531.0019 | 566.2676 | 1831.8372 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7103.7232 | 4146.9848 | -532.8134 | 571.6184 | 1837.1879 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13088.8301 | -3713.001 | 9.64 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13088.8301 | 3838.7093 | 9.71 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13321.2532 | -3994.1701 | 9.94 | 6 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13321.2532 | 4146.9848 | 10.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.665 | 203] 1.5 [DL + RSY] | 13780.9916 | -108.5089 | 3803.6206 |
| Bottom | 0.688 | 203] 1.5 [DL + RSY] | 14013.8403 | 132.4363 | 4179.9765 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7155.4019 | 3803.6206 | -537.1306 | 572.8173 | 1838.3869 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7386.2314 | 4179.9765 | -539.4505 | 578.1726 | 1843.7421 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13780.9916 | -3699.7705 | 10.03 | 6 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 13780.9916 | 3803.6206 | 10.09 | 6 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 14013.8403 | -4018.2218 | 10.34 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14013.8403 | 4179.9765 | 10.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.685 | 203] 1.5 [DL + RSY] | 14478.2283 | -104.3921 | 3767.3794 |
| Bottom | 0.709 | 203] 1.5 [DL + RSY] | 14711.2557 | 128.3004 | 4255.2487 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7433.5992 | 3767.3794 | 558.5619 | 579.2715 | 1844.8411 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7664.5033 | 4255.2487 | 561.5687 | 584.6285 | 1850.198 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14478.2283 | -3671.7325 | 10.41 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14478.2283 | 3767.3794 | 10.46 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14711.2557 | -4035.9994 | 10.75 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14711.2557 | 4255.2487 | 10.88 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.711 | 203] 1.5 [DL + RSY] | 15179.5108 | -98.5431 | 3737.3687 |
| Bottom | 0.738 | 203] 1.5 [DL + RSY] | 15412.6711 | 123.9955 | 4370.4497 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7708.7749 | 3737.3687 | -601.2347 | 585.6556 | 1851.2251 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7939.7747 | 4370.4497 | -604.8626 | 591.0148 | 1856.5843 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15179.5108 | -3602.9474 | 10.77 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15179.5108 | 3737.3687 | 10.84 | 6 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15412.6711 | -4128.3889 | 11.21 | 6 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15412.6711 | 4370.4497 | 11.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.738 | 203] 1.5 [DL + RSY] | 15882.9086 | -91.5582 | 3706.701 |
| Bottom | 0.768 | 203] 1.5 [DL + RSY] | 16116.1693 | 118.5532 | 4610.6517 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7982.3921 | 3706.701 | -656.0211 | 592.0035 | 1857.5731 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8213.5092 | 4610.6517 | -659.9562 | 597.3654 | 1862.935 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15882.9086 | -3568.2602 | 11.15 | 6 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 15882.9086 | 3706.701 | 11.23 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16116.1693 | -4385.9548 | 11.76 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16116.1693 | 4610.6517 | 11.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.766 | 203] 1.5 [DL + RSY] | 16585.6788 | -84.3581 | 3778.4828 |
| Bottom | 0.8 | 203] 1.5 [DL + RSY] | 16818.9991 | 111.9719 | 5074.8456 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8257.3182 | 3778.4828 | -716.0814 | 598.3818 | 1863.9513 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8488.5716 | 5074.8456 | -719.9325 | 603.7469 | 1869.3164 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16585.6788 | -3677.8932 | 11.61 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16585.6788 | 3778.4828 | 11.67 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16818.9991 | -4915.6892 | 12.47 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16818.9991 | 5074.8456 | 12.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.78 | 203] 1.5 [DL + RSY] | 17283.7939 | -76.808 | 4101.4992 |
| Bottom | 0.82 | 203] 1.5 [DL + RSY] | 17517.133 | 103.9473 | 5830.5087 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8537.9554 | 4101.4992 | -778.4874 | 604.8926 | 1870.4621 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8769.3684 | 5830.5087 | -781.8961 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17283.7939 | -4089.7223 | 12.25 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17283.7939 | 4101.4992 | 12.26 | 6 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17517.133 | -5805.4121 | 13.39 | 6 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17517.133 | 5830.5087 | 13.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.814 | 203] 1.5 [DL + RSY] | 17971.6782 | -68.9231 | -4943.7595 |
| Bottom | 0.858 | 203] 1.5 [DL + RSY] | 18205.015 | 91.3432 | -7091.7937 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8830.6044 | 4793.7509 | -836.9561 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9062.2284 | 6925.0304 | -839.6543 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17971.6782 | -4943.7595 | 13.14 | 6 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 17971.6782 | 4793.7509 | 13.06 | 6 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18205.015 | -7091.7937 | 14.53 | 6 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18205.015 | 6925.0304 | 14.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.856 | 203] 1.5 [DL + RSY] | 18641.5947 | -63.9917 | -6293.6661 |
| Bottom | 0.907 | 203] 1.5 [DL + RSY] | 18881.2919 | 72.0735 | -8827.5549 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9143.6211 | 5919.1767 | 879.2628 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9382.0031 | 8583.2686 | 881.1383 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18641.5947 | -6293.6661 | 14.32 | 6 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 18641.5947 | 5919.1767 | 14.1 | 6 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18881.2919 | -8827.5549 | 15.94 | 6 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18881.2919 | 8583.2686 | 15.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.157 | 203] 1.5 [DL + RSY] | 19380.03 | -587.5291 | 7976.2703 |
| Bottom | 1.273 | 203] 1.5 [DL + RSY] | 19682.0244 | 596.4077 | -11690.9969 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9617.2741 | 7976.2703 | -1010.5852 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9918.4554 | 11599.8554 | -1011.8354 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 19380.03 | -7699.4215 | 15.56 | 6 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 19380.03 | 7976.2703 | 15.72 | 6 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19682.0244 | -11690.9969 | 18.07 | 6 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19682.0244 | 11599.8554 | 18.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.227 | 203] 1.5 [DL + RSY] | 20065.2397 | -523.0892 | 11448.6772 |
| Bottom | 1.344 | 203] 1.5 [DL + RSY] | 20355.2033 | 530.8991 | 15250.6782 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10127.368 | 11448.6772 | 953.9561 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10417.0393 | 15250.6782 | 954.1888 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 20065.2397 | -10738.3686 | 17.73 | 6 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 20065.2397 | 11448.6772 | 18.15 | 6 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 20355.2033 | -13960.6567 | 19.78 | 6 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20355.2033 | 15250.6782 | 20.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.178 | 206] [0.9 DL + 1.5 RSX] | 827.5765 | -148.3256 | -208.7214 |
| Bottom | 0.882 | 206] [0.9 DL + 1.5 RSX] | 855.2096 | 142.0172 | -36.5855 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1513.0492 | -151.1723 | 146.8442 | 134.0897 | 415.5679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1559.1044 | 84.0903 | 147.2653 | 135.2305 | 416.7088 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1696.8423 | -225.7152 | 7.02 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1742.8974 | -38.3756 | 4.92 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1742.8974 | 29.425 | 4.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.852 | 206] [0.9 DL + 1.5 RSX] | 913.2237 | -137.5059 | 89.2287 |
| Bottom | 0.816 | 202] 1.5 [DL + RSX] | 1972.8099 | 163.4819 | -73.4068 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1727.5397 | 186.633 | -94.7715 | 139.4029 | 420.8812 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1773.5948 | 44.7835 | -95.2736 | 140.5438 | 422.022 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1822.4334 | -26.0146 | 4.98 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1926.7548 | 121.3524 | 6.38 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1868.4886 | -135.416 | 6.39 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1868.4886 | 44.7835 | 5.32 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.848 | 202] 1.5 [DL + RSX] | 2162.5075 | -166.5132 | 86.2621 |
| Bottom | 0.835 | 202] 1.5 [DL + RSX] | 2208.5626 | 165.234 | -67.7292 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1935.7065 | 151.2477 | -82.2426 | 144.5595 | 426.0378 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1981.7616 | 53.8973 | -82.7081 | 144.9136 | 426.3919 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2021.2816 | -70.8218 | 6.02 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2162.5075 | 86.2621 | 6.57 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2208.5626 | -67.7292 | 6.46 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2067.3368 | 53.8973 | 5.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.87 | 202] 1.5 [DL + RSX] | 2402.4228 | -166.2788 | 92.0591 |
| Bottom | 0.864 | 202] 1.5 [DL + RSX] | 2448.4779 | 165.3682 | -67.1876 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2132.7712 | 155.4945 | -83.2569 | 144.9136 | 426.3919 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2178.8263 | 57.7979 | -83.7356 | 144.9136 | 426.3919 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2402.4228 | -6.7122 | 6.24 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2402.4228 | 92.0591 | 7.25 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2448.4779 | -11.4868 | 6.41 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2285.86 | 57.7979 | 6.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.848 | 202] 1.5 [DL + RSX] | 2646.9836 | -166.2999 | 92.9775 |
| Bottom | 0.842 | 202] 1.5 [DL + RSX] | 2693.0388 | 165.3953 | -68.0637 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2325.6545 | 155.3287 | -83.0973 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2371.7097 | 60.7462 | -83.5908 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2646.9836 | -10.0357 | 6.91 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2646.9836 | 92.9775 | 7.89 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2693.0388 | -8.8013 | 7.01 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2518.3411 | 60.7462 | 7.18 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.879 | 202] 1.5 [DL + RSX] | 2896.4345 | -165.9888 | 93.2508 |
| Bottom | 0.874 | 202] 1.5 [DL + RSX] | 2942.4896 | 165.1448 | -69.2827 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2519.5123 | 154.3474 | -82.8656 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2565.5674 | 63.8441 | -83.3608 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2896.4345 | -13.2197 | 7.58 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2896.4345 | 93.2508 | 8.53 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2942.4896 | -5.4785 | 7.61 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2760.0534 | 63.8441 | 7.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 202] 1.5 [DL + RSX] | 3151.1756 | -165.3769 | 93.1478 |
| Bottom | 0.907 | 202] 1.5 [DL + RSX] | 3197.2307 | 164.6133 | -70.4431 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2716.4244 | 152.529 | -82.521 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2762.4796 | 67.4941 | -82.9943 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3151.1756 | -16.0654 | 8.27 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3151.1756 | 93.1478 | 9.18 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3197.2307 | -1.9145 | 8.22 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3009.6343 | 67.4941 | 8.52 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.947 | 202] 1.5 [DL + RSX] | 3411.6412 | -164.4073 | 92.3833 |
| Bottom | 0.948 | 202] 1.5 [DL + RSX] | 3457.6963 | 163.7508 | -71.8264 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2917.2668 | 149.9504 | -81.963 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2963.322 | 71.6433 | -82.3921 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3411.6412 | -18.2555 | 8.96 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3411.6412 | 92.3833 | 9.84 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3457.6963 | -71.8264 | 9.72 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3457.6963 | 2.0601 | 8.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.987 | 202] 1.5 [DL + RSX] | 3678.3217 | -163.0569 | 90.505 |
| Bottom | 0.989 | 202] 1.5 [DL + RSX] | 3724.3769 | 162.5328 | -73.9397 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3122.577 | 146.8564 | -81.0584 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3168.6322 | 76.2735 | -81.4315 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3678.3217 | -19.4777 | 9.66 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3678.3217 | 90.505 | 10.5 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3724.3769 | -73.9397 | 10.42 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3724.3769 | 7.3402 | 9.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.027 | 202] 1.5 [DL + RSX] | 3951.7534 | -161.2806 | 87.2335 |
| Bottom | 1.03 | 202] 1.5 [DL + RSX] | 3997.8085 | 161.0865 | -75.5518 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3332.8217 | 143.7702 | -79.1417 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3378.8768 | 83.1224 | -79.4603 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3951.7534 | -19.0491 | 10.36 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3951.7534 | 87.2335 | 11.17 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3997.8085 | -75.5518 | 11.14 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3997.8085 | 16.9099 | 10.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.065 | 202] 1.5 [DL + RSX] | 4232.3945 | -158.2816 | 84.288 |
| Bottom | 1.083 | 202] 1.5 [DL + RSX] | 4278.4496 | 158.2618 | -122.4915 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3548.2249 | 143.6766 | -90.8564 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3594.28 | 45.1442 | -91.1369 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4232.3945 | -13.7462 | 11.01 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4232.3945 | 84.288 | 11.85 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4278.4496 | -13.4923 | 11.13 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4089.643 | 45.1442 | 11.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.097 | 202] 1.5 [DL + RSX] | 4521.4611 | -155.6881 | -54.666 |
| Bottom | 1.162 | 202] 1.5 [DL + RSX] | 4567.5162 | 157.2944 | 261.5352 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3770.1162 | 97.6835 | 133.7409 | 178.6897 | 460.1679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3816.1714 | 345.0125 | 133.8935 | 178.6897 | 460.1679 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4521.4611 | -54.666 | 12.24 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4521.4611 | 30.7029 | 11.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2743.4461 | -39.0686 | 7.5 | 6 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4567.5162 | 261.5352 | 14.81 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.051 | 202] 1.5 [DL + RSX] | 4798.9474 | -209.6875 | -668.9282 |
| Bottom | 0.94 | 202] 1.5 [DL + RSX] | 4859.1733 | 205.4318 | 110.5821 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4000.2273 | -414.3618 | 280.4014 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4060.4533 | 216.3498 | 280.5205 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4798.9474 | -462.2459 | 12.61 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4859.1733 | -29.9967 | 9.74 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4859.1733 | 110.5821 | 10.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.941 | 202] 1.5 [DL + RSX] | 5081.6156 | -190.2635 | 112.7885 |
| Bottom | 0.945 | 202] 1.5 [DL + RSX] | 5141.8416 | 193.3664 | -62.3468 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4245.7294 | 191.2883 | -90.8769 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4305.9554 | 176.286 | -91.3356 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4932.353 | -57.5616 | 10.07 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5081.6156 | 112.7885 | 10.74 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5141.8416 | -62.3468 | 10.51 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5141.8416 | 59.8088 | 10.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.966 | 202] 1.5 [DL + RSX] | 5371.7596 | -189.1319 | 70.8244 |
| Bottom | 0.974 | 202] 1.5 [DL + RSX] | 5431.9856 | 190.4177 | -65.6771 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4497.6919 | 145.6212 | -78.4463 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4557.9178 | 170.8737 | -79.0452 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5371.7596 | -26.8815 | 10.72 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5371.7596 | 70.8244 | 11.02 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5431.9856 | -65.6771 | 11.11 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5431.9856 | 48.001 | 10.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.994 | 202] 1.5 [DL + RSX] | 5670.1495 | -183.3848 | 57.3796 |
| Bottom | 1.005 | 202] 1.5 [DL + RSX] | 5730.3755 | 185.4468 | -58.8918 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4757.1103 | 123.0775 | -71.0875 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4817.3362 | 181.413 | -71.8011 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5670.1495 | -42.932 | 11.42 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5670.1495 | 57.3796 | 11.52 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5730.3755 | -58.8918 | 11.64 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5730.3755 | 53.4119 | 11.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.026 | 202] 1.5 [DL + RSX] | 5977.0775 | -176.7428 | 53.2731 |
| Bottom | 1.038 | 202] 1.5 [DL + RSX] | 6037.3034 | 179.428 | 60.3172 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5024.7551 | 107.0612 | -67.3987 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5084.981 | 193.0726 | -68.1795 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5977.0775 | -43.188 | 12.02 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5977.0775 | 53.2731 | 12.09 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6037.3034 | -56.5527 | 12.23 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6037.3034 | 60.3172 | 12.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.057 | 202] 1.5 [DL + RSX] | 6293.063 | -168.8463 | 44.7548 |
| Bottom | 1.072 | 202] 1.5 [DL + RSX] | 6353.289 | 172.2513 | 71.0607 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5301.6627 | 85.4772 | 65.8757 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5361.8886 | 208.6672 | 66.6655 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6293.063 | -42.4025 | 12.63 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6293.063 | 44.7548 | 12.65 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6353.289 | -57.3709 | 12.85 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6353.289 | 71.0607 | 12.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.087 | 202] 1.5 [DL + RSX] | 6618.8401 | -159.4377 | -39.2567 |
| Bottom | 1.108 | 202] 1.5 [DL + RSX] | 6679.0661 | 164.0055 | 87.8916 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5589.3031 | 63.8428 | 66.5463 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5649.529 | 230.7946 | 67.2775 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6618.8401 | -39.2567 | 13.25 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6618.8401 | 33.7276 | 13.21 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6679.0661 | -60.9056 | 13.52 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6679.0661 | 87.8916 | 13.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.115 | 202] 1.5 [DL + RSX] | 6955.2937 | -147.2161 | -34.5802 |
| Bottom | 1.141 | 202] 1.5 [DL + RSX] | 7015.5196 | 152.2328 | 106.527 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5889.5933 | 56.4697 | 64.48 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5949.8193 | 253.756 | 65.0952 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6955.2937 | -34.5802 | 13.88 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6955.2937 | 23.8167 | 13.8 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7015.5196 | -78.6289 | 14.3 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7015.5196 | 106.527 | 14.49 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.149 | 202] 1.5 [DL + RSX] | 7302.8186 | -134.9267 | -49.5087 |
| Bottom | 1.187 | 202] 1.5 [DL + RSX] | 7364.9565 | 149.6298 | 125.9336 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6204.2305 | 71.668 | 57.5687 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6266.3685 | 271.2179 | 58.0404 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7325.4321 | -101.8529 | 15.07 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7325.4321 | 71.668 | 14.86 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7387.57 | -245.6404 | 16.19 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7387.57 | 271.2179 | 16.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.384 | 202] 1.5 [DL + RSX] | 7680.786 | 297.3124 | -74.8076 |
| Bottom | 1.421 | 202] 1.5 [DL + RSX] | 7761.0873 | 299.6733 | 216.1092 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6553.0746 | 108.7384 | 57.2866 | 222.2736 | 590.3606 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6633.3759 | 368.8166 | 57.595 | 222.2736 | 590.3606 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7726.4468 | -145.6121 | 16.16 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7726.4468 | 108.7384 | 15.9 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7806.7481 | -319.0192 | 17.52 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7806.7481 | 368.8166 | 17.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.395 | 202] 1.5 [DL + RSX] | 8151.2483 | 258.7531 | -168.7303 |
| Bottom | 1.428 | 202] 1.5 [DL + RSX] | 8228.1081 | 260.8233 | 309.4124 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7013.0094 | 192.4958 | 76.1945 | 222.2736 | 590.3606 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7089.8692 | 506.75 | 76.2486 | 222.2736 | 590.3606 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8210.0765 | -261.1021 | 17.91 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8210.0765 | 192.4958 | 17.43 | 6 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8286.9363 | -446.0801 | 19.34 | 6 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8286.9363 | 506.75 | 19.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.675 | 202] 1.5 [DL + RSX] | 1088.3302 | 115.8978 | -170.8076 |
| Bottom | 0.516 | 202] 1.5 [DL + RSX] | 1306.6645 | -104.1435 | -32.8203 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1013.6249 | -133.8979 | 53.559 | 114.2867 | 374.1128 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1056.1373 | 20.6619 | 53.8158 | 115.3398 | 375.1659 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1338.8574 | -171.4718 | 6.1 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1381.3699 | -43.4137 | 4.44 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1381.3699 | 20.6619 | 4.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.525 | 202] 1.5 [DL + RSX] | 1516.4373 | 98.1386 | 49.6731 |
| Bottom | 0.527 | 202] 1.5 [DL + RSX] | 1558.9497 | -99.143 | -32.6544 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1230.0554 | 67.5548 | -29.3696 | 119.648 | 379.4741 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1272.5678 | 30.1904 | -29.7191 | 120.7011 | 380.5272 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1574.5984 | -39.8239 | 4.93 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1574.5984 | 67.5548 | 5.31 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1617.1109 | -49.7087 | 5.18 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1617.1109 | 30.1904 | 4.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.572 | 202] 1.5 [DL + RSX] | 1772.6353 | 101.1351 | 59.0468 |
| Bottom | 0.563 | 202] 1.5 [DL + RSX] | 1815.1478 | -99.8995 | -34.4699 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1445.1348 | 73.4819 | -31.7562 | 124.9758 | 384.8019 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1487.6473 | 31.9144 | -32.1715 | 126.0289 | 385.855 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1810.8517 | -40.6777 | 5.6 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1810.8517 | 73.4819 | 6.05 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1853.3641 | -57.3791 | 5.95 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1853.3641 | 31.9144 | 5.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.605 | 202] 1.5 [DL + RSX] | 2031.1582 | 100.8285 | 59.0536 |
| Bottom | 0.602 | 202] 1.5 [DL + RSX] | 2073.6707 | -99.8762 | -33.6163 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1658.9485 | 72.8559 | -31.0878 | 130.2723 | 390.0984 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1701.461 | 35.2749 | -31.5767 | 131.3254 | 391.1515 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2046.8947 | -45.6064 | 6.32 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2046.8947 | 72.8559 | 6.7 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2089.4071 | -58.9962 | 6.62 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2089.4071 | 35.2749 | 6.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.649 | 202] 1.5 [DL + RSX] | 2291.2999 | 101.1226 | 61.8348 |
| Bottom | 0.647 | 202] 1.5 [DL + RSX] | 2333.8123 | -100.1303 | -35.5036 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1871.7795 | 75.0726 | -31.9738 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1914.2919 | 36.3644 | -32.5177 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2291.2999 | -32.6209 | 6.82 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2291.2999 | 61.8348 | 7.22 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2333.8123 | -35.5036 | 6.98 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2333.8123 | 11.266 | 6.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.695 | 202] 1.5 [DL + RSX] | 2552.6827 | 101.2302 | 63.3163 |
| Bottom | 0.693 | 202] 1.5 [DL + RSX] | 2595.1951 | -100.3249 | -37.9499 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2083.633 | 75.4405 | -32.6069 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2126.1454 | 37.3078 | -33.1659 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2552.6827 | -34.3566 | 7.57 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2552.6827 | 63.3163 | 7.97 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2595.1951 | -37.9499 | 7.74 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2595.1951 | 13.1617 | 7.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.702 | 202] 1.5 [DL + RSX] | 2814.9997 | 101.3057 | 64.4227 |
| Bottom | 0.7 | 202] 1.5 [DL + RSX] | 2857.5121 | -100.4896 | -40.0653 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2294.3087 | 75.0018 | -33.15 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2336.8211 | 38.9071 | -33.6788 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2814.9997 | -35.9192 | 8.32 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2814.9997 | 64.4227 | 8.71 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2857.5121 | -40.0653 | 8.49 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2857.5121 | 15.0769 | 8.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.745 | 202] 1.5 [DL + RSX] | 3078.0039 | 101.2861 | 64.8758 |
| Bottom | 0.745 | 202] 1.5 [DL + RSX] | 3120.5163 | -100.5961 | -42.0183 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2503.553 | 74.1895 | -33.4708 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2546.0655 | 41.3332 | -33.934 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3078.0039 | -36.6315 | 9.06 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3078.0039 | 64.8758 | 9.45 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3120.5163 | -42.0183 | 9.25 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3120.5163 | 17.4763 | 8.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.809 | 202] 1.5 [DL + RSX] | 3341.4706 | 101.1099 | 64.4274 |
| Bottom | 0.813 | 202] 1.5 [DL + RSX] | 3383.983 | -100.6177 | -43.9287 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2711.1092 | 73.7016 | -33.2752 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2753.6216 | 45.0717 | -33.6554 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3341.4706 | -35.8671 | 9.78 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3341.4706 | 64.4274 | 10.18 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3383.983 | -43.9287 | 10.01 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3383.983 | 22.2067 | 9.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.858 | 202] 1.5 [DL + RSX] | 3605.1802 | 100.6605 | 63.8071 |
| Bottom | 0.864 | 202] 1.5 [DL + RSX] | 3647.6927 | -100.197 | -57.9656 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2916.7351 | 75.2003 | -36.3839 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2959.2475 | 39.3417 | -36.6819 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3605.1802 | -32.3542 | 10.46 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3605.1802 | 63.8071 | 10.9 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3647.6927 | -57.9656 | 10.94 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3647.6927 | 20.2309 | 10.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.882 | 202] 1.5 [DL + RSX] | 3868.7281 | 100.5858 | 50.9369 |
| Bottom | 0.896 | 202] 1.5 [DL + RSX] | 3911.2405 | -99.8544 | -101.326 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3120.1363 | 67.7536 | -45.632 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3162.6488 | 20.4856 | -45.8574 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3868.7281 | -36.5725 | 11.25 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3868.7281 | 50.9369 | 11.45 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3911.2405 | -101.326 | 12.27 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3911.2405 | 6.4864 | 10.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.932 | 202] 1.5 [DL + RSX] | 4129.3907 | 100.6848 | -60.9881 |
| Bottom | 0.989 | 202] 1.5 [DL + RSX] | 4171.9032 | -105.3989 | 274.0962 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3319.2328 | 30.1765 | 102.0091 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3361.7452 | 288.7153 | 102.1007 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4129.3907 | -60.9881 | 12.32 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4129.3907 | 7.7297 | 11.58 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4171.9032 | 274.0962 | 15.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.949 | 202] 1.5 [DL + RSX] | 4422.8462 | 169.3438 | -759.277 |
| Bottom | 0.823 | 202] 1.5 [DL + RSX] | 4483.0722 | -160.5624 | -124.2925 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3533.4838 | -565.7126 | 221.584 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3593.7098 | 94.0809 | 221.8484 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4422.8462 | -541.9911 | 12.42 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4483.0722 | -124.2925 | 9.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4483.0722 | 52.0555 | 9.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.836 | 202] 1.5 [DL + RSX] | 4735.5399 | 156.0635 | -65.2958 |
| Bottom | 0.851 | 202] 1.5 [DL + RSX] | 4795.7658 | -157.5418 | 104.5553 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3749.609 | 73.496 | 49.8881 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3809.835 | 162.6998 | 50.3077 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4735.5399 | -65.2958 | 9.74 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4735.5399 | 29.9914 | 9.49 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4795.7658 | -37.3832 | 9.66 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4795.7658 | 104.5553 | 10.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 202] 1.5 [DL + RSX] | 5047.7505 | 152.5751 | 110.5541 |
| Bottom | 0.884 | 202] 1.5 [DL + RSX] | 5107.9765 | -154.157 | -72.7123 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3964.8558 | 153.3413 | -56.1828 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4025.0818 | 129.3098 | -56.8301 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5047.7505 | -0.4968 | 9.9 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5047.7505 | 110.5541 | 10.66 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5107.9765 | -72.7123 | 10.52 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5107.9765 | 64.8096 | 10.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.911 | 202] 1.5 [DL + RSX] | 5359.0471 | 148.7446 | 77.8489 |
| Bottom | 0.922 | 202] 1.5 [DL + RSX] | 5419.2731 | -150.5352 | -82.3476 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4178.1534 | 116.731 | -49.1843 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4238.3793 | 126.9731 | -50.004 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5359.0471 | -35.4642 | 10.75 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5359.0471 | 77.8489 | 11.05 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5419.2731 | -82.3476 | 11.2 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5419.2731 | 57.5026 | 11.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.946 | 202] 1.5 [DL + RSX] | 5668.4633 | 144.61 | 67.595 |
| Bottom | 0.959 | 202] 1.5 [DL + RSX] | 5728.6893 | -146.9086 | -85.9962 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4389.1384 | 102.3012 | -46.7604 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4449.3644 | 136.9219 | -47.6781 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5668.4633 | -38.7049 | 11.38 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5668.4633 | 67.595 | 11.58 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5728.6893 | -85.9962 | 11.83 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5728.6893 | 63.8734 | 11.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.98 | 202] 1.5 [DL + RSX] | 5975.4703 | 139.3401 | 63.1661 |
| Bottom | 0.996 | 202] 1.5 [DL + RSX] | 6035.6963 | -142.461 | -95.4511 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4598.2292 | 97.0695 | -47.156 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4658.4552 | 149.7328 | -48.0889 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5975.4703 | -28.1393 | 11.91 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5975.4703 | 63.1661 | 12.15 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6035.6963 | -95.4511 | 12.5 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6035.6963 | 74.839 | 12.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.011 | 202] 1.5 [DL + RSX] | 6279.3336 | 133.0415 | 55.4477 |
| Bottom | 1.033 | 202] 1.5 [DL + RSX] | 6339.5596 | -137.3733 | -114.3261 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4806.0656 | 96.3806 | -47.976 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4866.2916 | 164.1632 | -48.8404 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6279.3336 | -14.7014 | 12.41 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6279.3336 | 55.4477 | 12.7 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6339.5596 | -114.3261 | 13.22 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6339.5596 | 89.6832 | 13.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.04 | 202] 1.5 [DL + RSX] | 6578.967 | 124.8333 | 49.7296 |
| Bottom | 1.066 | 202] 1.5 [DL + RSX] | 6639.193 | -129.0637 | -137.3902 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5013.4426 | 104.7532 | -46.3196 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5073.6686 | 191.7513 | -47.0424 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6578.967 | -8.2905 | 12.96 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6578.967 | 49.7296 | 13.24 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6639.193 | -137.3902 | 13.97 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6639.193 | 121.0099 | 13.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.076 | 202] 1.5 [DL + RSX] | 6873.1112 | 118.2218 | 75.5798 |
| Bottom | 1.127 | 202] 1.5 [DL + RSX] | 6935.2491 | -137.1901 | 256.8972 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5221.1753 | 135.4737 | 57.1651 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5283.3132 | 329.2444 | 57.6813 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6873.1112 | -20.6451 | 13.62 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6873.1112 | 75.5798 | 14 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6935.2491 | -118.4825 | 14.42 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6405.297 | 329.2444 | 14.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.366 | 202] 1.5 [DL + RSX] | 7344.6088 | 272.4333 | -221.754 |
| Bottom | 1.41 | 202] 1.5 [DL + RSX] | 7424.9101 | -274.7942 | 418.413 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5053.7758 | -52.0831 | 110.2515 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5134.0771 | 418.413 | 110.3021 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7344.6088 | -52.0831 | 14.76 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4864.9319 | 2.6843 | 9.56 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7424.9101 | -174.827 | 15.77 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7424.9101 | 418.413 | 17.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.408 | 202] 1.5 [DL + RSX] | 7815.5811 | 253.7331 | -320.8224 |
| Bottom | 1.446 | 202] 1.5 [DL + RSX] | 7892.441 | 255.8033 | 487.9466 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6042.1879 | 151.2794 | 89.5324 | 198.2928 | 566.3798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6119.0477 | 517.3721 | 89.586 | 198.2928 | 566.3798 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7815.5811 | -320.8224 | 17.54 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7815.5811 | 124.0418 | 16.18 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7892.441 | -390.1533 | 18.18 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7892.441 | 487.9466 | 18.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.701 | 202] 1.5 [DL + RSX] | 1150.9113 | -109.5187 | -259.2962 |
| Bottom | 0.509 | 202] 1.5 [DL + RSX] | 1320.2461 | 96.4608 | 74.4997 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1101.2894 | -122.5226 | 127.4736 | 116.4583 | 376.2843 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1143.8019 | 105.0793 | 127.7633 | 117.5114 | 377.3374 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1327.3556 | -306.6302 | 7.95 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1369.868 | -21.936 | 4.11 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1369.868 | 105.0793 | 5.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.498 | 202] 1.5 [DL + RSX] | 1528.8027 | -88.0435 | -56.4119 |
| Bottom | 0.508 | 202] 1.5 [DL + RSX] | 1571.3152 | 89.6748 | 54.5719 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1338.2006 | 64.9431 | 46.5165 | 122.3269 | 382.153 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1380.7131 | 87.3975 | 46.8424 | 123.38 | 383.2061 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1556.5806 | -78.3352 | 5.41 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1556.5806 | 64.9431 | 5.23 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1599.093 | -41.3792 | 5.02 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1599.093 | 87.3975 | 5.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.559 | 202] 1.5 [DL + RSX] | 1782.2035 | -93.3184 | -82.6883 |
| Bottom | 0.55 | 202] 1.5 [DL + RSX] | 1824.7159 | 92.0959 | 57.687 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1571.621 | 54.2222 | 55.6419 | 128.1091 | 387.9352 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1614.1334 | 95.0477 | 55.9668 | 129.1622 | 388.9883 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1785.0275 | -103.0767 | 6.39 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1785.0275 | 54.2222 | 5.71 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1827.54 | -43.7499 | 5.68 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1827.54 | 95.0477 | 6.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.596 | 202] 1.5 [DL + RSX] | 2037.8786 | -93.8376 | -84.9058 |
| Bottom | 0.594 | 202] 1.5 [DL + RSX] | 2080.391 | 93.1394 | 60.1941 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1803.6036 | 58.0146 | 55.4903 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1846.1161 | 98.0486 | 55.8618 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2037.8786 | -84.9058 | 6.84 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2037.8786 | 40.2582 | 6.22 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2057.0391 | -46.6595 | 6.36 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2080.391 | 60.1941 | 6.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.63 | 202] 1.5 [DL + RSX] | 2294.987 | -95.3315 | -88.1507 |
| Bottom | 0.629 | 202] 1.5 [DL + RSX] | 2337.4994 | 94.6564 | 63.5572 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2034.3851 | 59.6989 | 55.8601 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2076.8976 | 99.4164 | 56.2824 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2294.987 | -88.1507 | 7.6 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2294.987 | 43.5387 | 6.98 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2337.4994 | -13.049 | 6.67 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2337.4994 | 63.5572 | 7.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 202] 1.5 [DL + RSX] | 2553.2107 | -96.6728 | -91.4738 |
| Bottom | 0.678 | 202] 1.5 [DL + RSX] | 2595.7232 | 96.1819 | 67.385 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2264.1699 | 60.8879 | 56.5685 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2306.6824 | 100.7121 | 57.0226 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2553.2107 | -91.4738 | 8.36 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2553.2107 | 46.1095 | 7.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2595.7232 | -17.4864 | 7.45 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2595.7232 | 67.385 | 8.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.721 | 202] 1.5 [DL + RSX] | 2812.4338 | -98.0992 | -94.283 |
| Bottom | 0.722 | 202] 1.5 [DL + RSX] | 2854.9463 | 97.7847 | 71.3039 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2493.1704 | 61.7889 | 57.3626 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2535.6829 | 102.4865 | 57.8163 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2812.4338 | -94.283 | 9.12 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2812.4338 | 48.5008 | 8.49 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2854.9463 | -21.6346 | 8.23 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2854.9463 | 71.3039 | 8.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.769 | 202] 1.5 [DL + RSX] | 3072.6598 | -99.5552 | -96.0273 |
| Bottom | 0.771 | 202] 1.5 [DL + RSX] | 3115.1722 | 99.4348 | 75.6738 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2721.6171 | 62.3975 | 58.0475 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2764.1295 | 104.7621 | 58.4681 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3072.6598 | -96.0273 | 9.87 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3072.6598 | 50.4054 | 9.24 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3115.1722 | -25.7662 | 9.01 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3115.1722 | 75.6738 | 9.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.796 | 202] 1.5 [DL + RSX] | 3333.9545 | -101.049 | -96.0499 |
| Bottom | 0.799 | 202] 1.5 [DL + RSX] | 3376.467 | 101.2331 | 81.0132 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2949.7502 | 63.1365 | 58.4137 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2992.2627 | 107.0354 | 58.7776 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3333.9545 | -96.0499 | 10.6 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3333.9545 | 51.4694 | 9.98 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3376.467 | -30.8062 | 9.81 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3376.467 | 81.0132 | 10.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.841 | 202] 1.5 [DL + RSX] | 3596.3448 | -102.3234 | -93.9029 |
| Bottom | 0.848 | 202] 1.5 [DL + RSX] | 3638.8572 | 102.449 | 88.4727 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3177.7513 | 64.4891 | 58.7919 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3220.2638 | 109.8638 | 59.0897 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3596.3448 | -93.9029 | 11.29 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3596.3448 | 51.0776 | 10.7 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3638.8572 | -38.2528 | 10.64 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3638.8572 | 88.4727 | 11.34 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.893 | 202] 1.5 [DL + RSX] | 3860.1718 | -104.6443 | -88.5451 |
| Bottom | 0.904 | 202] 1.5 [DL + RSX] | 3902.6843 | 106.726 | -90.3457 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3406.0984 | 65.6697 | 44.3968 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3448.6109 | 67.3483 | 44.6358 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3860.1718 | -88.5451 | 11.95 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3860.1718 | 47.3324 | 11.38 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3902.6843 | -90.3457 | 12.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3902.6843 | 56.4047 | 11.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.942 | 202] 1.5 [DL + RSX] | 4127.3017 | -101.9916 | -128.3312 |
| Bottom | 0.993 | 202] 1.5 [DL + RSX] | 4169.8141 | 99.9338 | 346.4367 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3636.6787 | 22.6643 | 158.4339 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3679.1911 | 377.7968 | 158.587 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4127.3017 | -8.1616 | 11.58 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3912.8689 | 22.6643 | 11.18 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4169.8141 | 346.4367 | 16.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.825 | 202] 1.5 [DL + RSX] | 4361.1827 | -106.926 | -1052.4115 |
| Bottom | 0.703 | 202] 1.5 [DL + RSX] | 4424.9514 | 104.2769 | 205.3157 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3842.6514 | -794.8459 | 416.8562 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3906.4201 | 271.1669 | 417.0129 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4361.1827 | -835.0206 | 13.23 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4424.9514 | -63.934 | 8.59 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4424.9514 | 205.3157 | 9.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.72 | 202] 1.5 [DL + RSX] | 4630.1533 | -100.5401 | -114.4664 |
| Bottom | 0.736 | 202] 1.5 [DL + RSX] | 4693.9219 | 102.7821 | 198.0415 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4094.1314 | 119.8128 | 113.7424 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4157.9001 | 276.8399 | 114.201 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4630.1533 | -114.4664 | 9.28 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4630.1533 | 65.5141 | 8.98 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4693.9219 | -49.9423 | 9 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4693.9219 | 198.0415 | 9.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.752 | 202] 1.5 [DL + RSX] | 4898.3515 | -98.8329 | -113.3405 |
| Bottom | 0.768 | 202] 1.5 [DL + RSX] | 4962.1202 | 101.4418 | 164.0196 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4342.8861 | 134.8148 | 102.3424 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4406.6547 | 252.324 | 102.9765 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4898.3515 | -113.3405 | 9.77 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4898.3515 | 85.7599 | 9.6 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4962.1202 | -74.9303 | 9.65 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4962.1202 | 164.0196 | 10.2 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.787 | 202] 1.5 [DL + RSX] | 5165.0843 | -96.3307 | -139.6855 |
| Bottom | 0.8 | 202] 1.5 [DL + RSX] | 5228.853 | 99.614 | 161.3816 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4588.5804 | 105.6463 | 109.5155 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4652.3491 | 257.4525 | 110.295 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5165.0843 | -139.6855 | 10.43 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5165.0843 | 65.0208 | 9.97 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5228.853 | -80.504 | 10.18 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5228.853 | 161.3816 | 10.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.818 | 202] 1.5 [DL + RSX] | 5430.6556 | -93.908 | -136.232 |
| Bottom | 0.834 | 202] 1.5 [DL + RSX] | 5494.4243 | 97.8959 | 168.6102 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4830.7132 | 91.5835 | 109.0251 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4894.4818 | 269.1903 | 109.904 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5430.6556 | -136.232 | 10.9 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5430.6556 | 61.0329 | 10.43 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5494.4243 | -87.2102 | 10.71 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5494.4243 | 168.6102 | 11.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.848 | 202] 1.5 [DL + RSX] | 5694.6563 | -90.7965 | -122.03 |
| Bottom | 0.867 | 202] 1.5 [DL + RSX] | 5758.425 | 95.9684 | 181.7575 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5066.6451 | 77.0585 | 106.0812 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5130.4137 | 283.6632 | 106.987 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5694.6563 | -122.03 | 11.3 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5694.6563 | 55.3691 | 10.89 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5758.425 | -99.9244 | 11.28 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5758.425 | 181.7575 | 11.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.875 | 202] 1.5 [DL + RSX] | 5956.5261 | -86.8147 | 43.0499 |
| Bottom | 0.901 | 202] 1.5 [DL + RSX] | 6020.2947 | 93.126 | 202.4726 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5292.8415 | 61.8105 | 102.2126 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5356.6102 | 302.6521 | 103.0637 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5956.5261 | -99.8618 | 11.65 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5956.5261 | 43.0499 | 11.3 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6020.2947 | -120.67 | 11.89 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6020.2947 | 202.4726 | 12.4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.91 | 202] 1.5 [DL + RSX] | 6215.7946 | -82.7755 | 22.5312 |
| Bottom | 0.936 | 202] 1.5 [DL + RSX] | 6279.5633 | 91.8425 | 232.42 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5509.7166 | 55.5956 | 97.3469 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5573.4853 | 328.4946 | 98.0651 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6215.7946 | -68.5283 | 11.93 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6215.7946 | 22.5312 | 11.65 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6279.5633 | -154.9835 | 12.59 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6279.5633 | 232.42 | 13.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.943 | 202] 1.5 [DL + RSX] | 6471.498 | -74.2743 | 9.8563 |
| Bottom | 0.966 | 202] 1.5 [DL + RSX] | 6537.2911 | 85.6373 | 258.1375 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5721.201 | 76.6266 | 82.0036 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5786.994 | 340.7063 | 82.5419 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6471.498 | -48.8454 | 12.29 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6471.498 | 9.8563 | 12.05 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6537.2911 | -218.9599 | 13.46 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6537.2911 | 258.1375 | 13.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.153 | 202] 1.5 [DL + RSX] | 6724.9545 | -255.2998 | -114.7879 |
| Bottom | 1.211 | 202] 1.5 [DL + RSX] | 6809.9794 | 257.7995 | 432.8133 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5289.883 | 49.8271 | 87.9543 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5374.9079 | 432.8133 | 88.0082 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6724.9545 | -114.7879 | 13.16 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6724.9545 | 49.8271 | 12.76 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6809.9794 | -389.6482 | 15.02 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6809.9794 | 432.8133 | 15.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.166 | 202] 1.5 [DL + RSX] | 7040.6578 | -229.2127 | -237.6097 |
| Bottom | 1.223 | 202] 1.5 [DL + RSX] | 7122.0388 | 231.4047 | 562.8444 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5529.588 | 165.8749 | 97.191 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5610.969 | 562.8444 | 97.2 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 7040.6578 | -237.6097 | 14.5 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7040.6578 | 165.8749 | 14.06 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7122.0388 | -490.3212 | 16.22 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7122.0388 | 562.8444 | 16.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.701 | 202] 1.5 [DL + RSX] | 1133.7988 | 109.6396 | -254.8844 |
| Bottom | 0.507 | 202] 1.5 [DL + RSX] | 1305.1747 | -96.967 | 69.4561 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1085.643 | -116.8741 | 124.4959 | 116.0707 | 375.8968 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1128.1555 | 99.8414 | 124.7733 | 117.1238 | 376.9499 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1310.818 | -302.4401 | 7.84 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1353.3304 | -26.9805 | 4.13 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1353.3304 | 99.8414 | 5.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.498 | 202] 1.5 [DL + RSX] | 1515.0781 | 88.5722 | -58.5275 |
| Bottom | 0.506 | 202] 1.5 [DL + RSX] | 1557.5906 | -90.1906 | 51.7944 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1319.9637 | 63.9582 | 45.9711 | 121.8752 | 381.7012 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1362.4761 | 84.1539 | 46.2908 | 122.9283 | 382.7543 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1538.9346 | -80.2944 | 5.39 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1538.9346 | 63.9582 | 5.16 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1581.447 | -44.2648 | 5.01 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1581.447 | 84.1539 | 5.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.559 | 202] 1.5 [DL + RSX] | 1769.7252 | 93.7308 | -83.57 |
| Bottom | 0.549 | 202] 1.5 [DL + RSX] | 1812.2376 | -92.4965 | 56.1334 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1550.7764 | 55.1834 | 55.1533 | 127.5927 | 387.4188 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1593.2889 | 92.6614 | 55.4854 | 128.6458 | 388.4719 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1769.7252 | -83.57 | 6.08 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1769.7252 | 34.3044 | 5.39 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1812.2376 | -9.0175 | 5.16 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1808.7404 | 92.6614 | 6.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.596 | 202] 1.5 [DL + RSX] | 2026.4504 | 94.3333 | -85.2326 |
| Bottom | 0.592 | 202] 1.5 [DL + RSX] | 2068.9628 | -93.5568 | 59.2635 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1780.0809 | 59.9273 | 55.1557 | 133.273 | 393.0991 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1822.5934 | 96.0676 | 55.5457 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2026.4504 | -85.2326 | 6.81 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2026.4504 | 41.2993 | 6.2 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2037.0227 | -47.9147 | 6.32 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2068.9628 | 59.2635 | 6.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.629 | 202] 1.5 [DL + RSX] | 2284.5057 | 95.9013 | -88.1922 |
| Bottom | 0.629 | 202] 1.5 [DL + RSX] | 2327.0181 | -95.1255 | 62.9041 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2008.1744 | 61.9285 | 55.694 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2050.6869 | 97.755 | 56.1371 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2284.5057 | -88.1922 | 7.57 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2284.5057 | 44.8647 | 6.97 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2327.0181 | -15.2201 | 6.68 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2327.0181 | 62.9041 | 7.34 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 202] 1.5 [DL + RSX] | 2543.644 | 97.3374 | -91.3982 |
| Bottom | 0.677 | 202] 1.5 [DL + RSX] | 2586.1564 | -96.7317 | 66.8311 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2235.2869 | 62.9452 | 56.5426 | 146.4192 | 406.2453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2277.7994 | 99.4617 | 57.0084 | 146.4192 | 406.2453 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2543.644 | -91.3982 | 8.34 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2543.644 | 47.5473 | 7.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2586.1564 | -19.6506 | 7.46 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2586.1564 | 66.8311 | 8.11 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.722 | 202] 1.5 [DL + RSX] | 2803.7975 | 98.8672 | -94.2095 |
| Bottom | 0.722 | 202] 1.5 [DL + RSX] | 2846.3099 | -98.4324 | 70.7653 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2461.6489 | 63.3512 | 57.4149 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2504.1614 | 101.7624 | 57.8633 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2803.7975 | -94.2095 | 9.1 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2803.7975 | 49.9234 | 8.48 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2846.3099 | -23.874 | 8.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2846.3099 | 70.7653 | 8.89 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.77 | 202] 1.5 [DL + RSX] | 3065.0027 | 100.433 | -96.047 |
| Bottom | 0.771 | 202] 1.5 [DL + RSX] | 3107.5151 | -100.1945 | 75.0801 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2687.5022 | 63.3367 | 58.0929 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2730.0147 | 104.5496 | 58.49 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3065.0027 | -96.047 | 9.85 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3065.0027 | 51.7157 | 9.23 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3107.5151 | -28.137 | 9.02 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3107.5151 | 75.0801 | 9.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.797 | 202] 1.5 [DL + RSX] | 3327.3473 | 102.0315 | -96.267 |
| Bottom | 0.799 | 202] 1.5 [DL + RSX] | 3369.8598 | -102.0992 | 80.2576 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2913.0921 | 63.4817 | 58.3751 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2955.6046 | 107.1343 | 58.7034 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3327.3473 | -96.267 | 10.58 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3327.3473 | 52.5609 | 9.97 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3369.8598 | -33.3711 | 9.82 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3369.8598 | 80.2576 | 10.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 202] 1.5 [DL + RSX] | 3590.8713 | 103.4175 | -94.4817 |
| Bottom | 0.849 | 202] 1.5 [DL + RSX] | 3633.3837 | -103.4735 | 87.5429 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3138.6021 | 64.3178 | 58.6699 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3181.1146 | 110.0445 | 58.931 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3590.8713 | -94.4817 | 11.29 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3590.8713 | 51.7828 | 10.69 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3633.3837 | -40.9616 | 10.66 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3633.3837 | 87.5429 | 11.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.894 | 202] 1.5 [DL + RSX] | 3855.9264 | 105.7627 | -89.5733 |
| Bottom | 0.905 | 202] 1.5 [DL + RSX] | 3898.4389 | -107.6609 | -93.8799 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3364.5066 | 65.1799 | 44.082 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3407.019 | 66.9273 | 44.2957 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3855.9264 | -89.5733 | 11.95 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3855.9264 | 47.5749 | 11.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3898.4389 | -93.8799 | 12.13 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3898.4389 | 55.2377 | 11.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.944 | 202] 1.5 [DL + RSX] | 4124.2735 | 103.4433 | -130.1993 |
| Bottom | 0.996 | 202] 1.5 [DL + RSX] | 4166.786 | -101.9696 | 341.9821 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3592.5916 | 21.3402 | 157.7952 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3635.104 | 375.2285 | 157.9392 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4124.2735 | -9.2936 | 11.59 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3884.3993 | 21.3402 | 11.09 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4166.786 | 341.9821 | 16.32 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.829 | 202] 1.5 [DL + RSX] | 4360.6008 | 109.074 | -1053.3761 |
| Bottom | 0.705 | 202] 1.5 [DL + RSX] | 4424.3695 | -106.045 | 214.4264 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3798.0234 | -784.8278 | 420.1953 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3861.7921 | 282.5934 | 420.354 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4360.6008 | -824.8207 | 13.17 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4424.3695 | -60.8732 | 8.57 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4424.3695 | 214.4264 | 9.52 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.722 | 202] 1.5 [DL + RSX] | 4631.5099 | 102.7727 | -111.8195 |
| Bottom | 0.739 | 202] 1.5 [DL + RSX] | 4695.2785 | -104.5832 | 203.4362 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4048.6638 | 126.6653 | 114.0369 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4112.4324 | 282.5989 | 114.5307 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4631.5099 | -111.8195 | 9.27 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4631.5099 | 70.3833 | 9.01 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4695.2785 | -49.8002 | 9 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4695.2785 | 203.4362 | 9.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.755 | 202] 1.5 [DL + RSX] | 4901.6436 | 100.9354 | -113.0162 |
| Bottom | 0.77 | 202] 1.5 [DL + RSX] | 4965.4122 | -103.1665 | 168.0102 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4296.6323 | 139.8682 | 103.1387 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4360.4009 | 254.8559 | 103.8153 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4901.6436 | -113.0162 | 9.77 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4901.6436 | 88.2835 | 9.62 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4965.4122 | -76.3904 | 9.67 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4965.4122 | 168.0102 | 10.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.789 | 202] 1.5 [DL + RSX] | 5170.2056 | 98.2266 | -140.3504 |
| Bottom | 0.803 | 202] 1.5 [DL + RSX] | 5233.9743 | -101.1767 | 164.8586 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4541.5825 | 109.493 | 110.715 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4605.3512 | 258.4995 | 111.5315 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5170.2056 | -140.3504 | 10.44 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5170.2056 | 66.5202 | 9.99 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5233.9743 | -82.9111 | 10.2 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5233.9743 | 164.8586 | 10.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.821 | 202] 1.5 [DL + RSX] | 5437.4709 | 95.6207 | -137.2913 |
| Bottom | 0.836 | 202] 1.5 [DL + RSX] | 5501.2396 | -99.2859 | 171.8223 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4783.0958 | 94.2688 | 110.4261 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4846.8645 | 269.6258 | 111.3293 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5437.4709 | -137.2913 | 10.92 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5437.4709 | 62.0287 | 10.45 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5501.2396 | -90.3955 | 10.75 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5501.2396 | 171.8223 | 11.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.85 | 202] 1.5 [DL + RSX] | 5702.9988 | 92.2728 | -123.294 |
| Bottom | 0.87 | 202] 1.5 [DL + RSX] | 5766.7675 | -97.1317 | 184.6758 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5018.7852 | 78.3536 | 107.5553 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5082.5539 | 283.867 | 108.4702 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5702.9988 | -123.294 | 11.32 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5702.9988 | 55.8872 | 10.91 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5766.7675 | -103.8368 | 11.32 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5766.7675 | 184.6758 | 11.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 202] 1.5 [DL + RSX] | 5966.1871 | 88.0319 | -101.3334 |
| Bottom | 0.903 | 202] 1.5 [DL + RSX] | 6029.9557 | -94.0426 | 204.9053 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5245.2074 | 61.3588 | 103.654 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5308.9761 | 302.5902 | 104.501 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5966.1871 | -101.3334 | 11.67 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5966.1871 | 42.963 | 11.31 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6029.9557 | -125.1538 | 11.94 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6029.9557 | 204.9053 | 12.43 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 202] 1.5 [DL + RSX] | 6226.5053 | 83.6287 | 21.8055 |
| Bottom | 0.938 | 202] 1.5 [DL + RSX] | 6290.274 | -92.3153 | 234.0751 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5461.9348 | 52.807 | 98.5734 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5525.7035 | 327.3968 | 99.2811 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6226.5053 | -70.4296 | 11.97 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6226.5053 | 21.8055 | 11.67 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6290.274 | -160.5498 | 12.64 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6290.274 | 234.0751 | 13.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 202] 1.5 [DL + RSX] | 6482.9267 | 75.0199 | 8.2712 |
| Bottom | 0.968 | 202] 1.5 [DL + RSX] | 6548.7198 | -86.2175 | 262.8618 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5672.2809 | 71.0268 | 84.7307 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5738.074 | 343.3929 | 85.2576 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6482.9267 | -51.8858 | 12.33 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6482.9267 | 8.2712 | 12.06 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6548.7198 | -224.0225 | 13.51 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6548.7198 | 262.8618 | 13.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.12 | 202] 1.5 [DL + RSX] | 6734.1982 | 233.0588 | -119.0744 |
| Bottom | 1.174 | 202] 1.5 [DL + RSX] | 6819.2231 | -235.5585 | 398.9965 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5179.861 | 49.8154 | 79.8891 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5264.8859 | 398.9965 | 79.9448 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6734.1982 | -119.0744 | 13.21 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6734.1982 | 49.8154 | 12.78 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6819.2231 | -348.1663 | 14.78 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6819.2231 | 398.9965 | 15.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.176 | 202] 1.5 [DL + RSX] | 7043.4796 | 230.5696 | -287.1487 |
| Bottom | 1.224 | 202] 1.5 [DL + RSX] | 7124.8606 | 232.7616 | 551.5365 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5446.4126 | 218.3532 | 81.3945 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5527.7936 | 551.5365 | 81.4037 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 7043.4796 | -287.1487 | 14.82 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7043.4796 | 218.3532 | 14.39 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7124.8606 | -485.9971 | 16.19 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7124.8606 | 551.5365 | 16.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.532 | 202] 1.5 [DL + RSX] | 1451.0337 | -80.6357 | 214.5758 |
| Bottom | 0.438 | 202] 1.5 [DL + RSX] | 1493.5462 | 73.7698 | 24.7112 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1353.0383 | 220.066 | -76.8091 | 122.6945 | 382.5206 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1395.5508 | 37.4954 | -76.7917 | 123.7476 | 383.5737 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1494.7132 | 220.066 | 7.21 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1537.2257 | -35.6505 | 4.77 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1537.2257 | 37.4954 | 4.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.491 | 202] 1.5 [DL + RSX] | 1665.442 | -72.7989 | -108.5147 |
| Bottom | 0.482 | 202] 1.5 [DL + RSX] | 1707.9544 | 73.0442 | 60.7817 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1522.2234 | -16.4369 | 52.2833 | 126.8854 | 386.7115 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1564.7358 | 77.0171 | 52.4128 | 127.9385 | 387.7646 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1709.6117 | -113.5554 | 6.33 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1063.2447 | 9.5615 | 3.09 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1752.1242 | -9.8002 | 5 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1752.1242 | 77.0171 | 5.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.526 | 202] 1.5 [DL + RSX] | 1885.8743 | -76.1995 | -84.0402 |
| Bottom | 0.526 | 202] 1.5 [DL + RSX] | 1928.3867 | 75.0091 | 63.8012 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1693.0628 | 14.513 | 43.5909 | 131.1174 | 390.9435 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1735.5753 | 83.8586 | 43.7584 | 132.1705 | 391.9966 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1925.5279 | -85.8607 | 6.54 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1925.5279 | 14.513 | 5.55 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1968.0403 | -9.8389 | 5.6 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1968.0403 | 83.8586 | 6.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.57 | 202] 1.5 [DL + RSX] | 2108.4044 | -78.3951 | -83.5026 |
| Bottom | 0.57 | 202] 1.5 [DL + RSX] | 2150.9169 | 77.16 | 64.2574 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1865.2462 | 18.6078 | 42.2296 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1907.7586 | 85.0999 | 42.4588 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2142.0574 | -84.2037 | 7.12 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2142.0574 | 18.6078 | 6.21 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2184.5698 | -12.0399 | 6.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2184.5698 | 85.0999 | 7.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 202] 1.5 [DL + RSX] | 2332.153 | -80.4782 | -85.4331 |
| Bottom | 0.614 | 202] 1.5 [DL + RSX] | 2374.6655 | 79.2987 | 65.7668 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2038.6688 | 18.7663 | 41.8485 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2081.1812 | 84.9862 | 42.1525 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2358.9938 | -85.37 | 7.74 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2358.9938 | 18.7663 | 6.81 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2401.5063 | -12.82 | 6.85 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2401.5063 | 84.9862 | 7.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.659 | 202] 1.5 [DL + RSX] | 2556.7397 | -82.3209 | -87.1429 |
| Bottom | 0.658 | 202] 1.5 [DL + RSX] | 2599.2522 | 81.2663 | 67.6406 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2213.1352 | 18.7426 | 41.6553 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2255.6476 | 84.4819 | 42.0137 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2576.1687 | -86.0675 | 8.35 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2576.1687 | 18.7426 | 7.42 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2618.6811 | -13.0183 | 7.45 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2618.6811 | 84.4819 | 8.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.665 | 202] 1.5 [DL + RSX] | 2781.8895 | -83.9982 | -88.4167 |
| Bottom | 0.665 | 202] 1.5 [DL + RSX] | 2824.402 | 83.0705 | 69.4434 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2399.9645 | 20.7866 | 42.3047 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2442.4769 | 69.4434 | 42.4712 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2793.4281 | -86.0378 | 8.95 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2793.4281 | 18.4078 | 8.02 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2835.9405 | -13.1848 | 8.06 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2835.9405 | 84.278 | 9.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.706 | 202] 1.5 [DL + RSX] | 3007.3542 | -85.4872 | -88.6584 |
| Bottom | 0.709 | 202] 1.5 [DL + RSX] | 3049.8666 | 84.7031 | 71.4957 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2567.5716 | 21.3734 | 43.0591 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2610.084 | 71.4957 | 43.2286 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3010.6029 | -85.1799 | 9.55 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3010.6029 | 17.8949 | 8.61 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3053.1153 | -13.4323 | 8.67 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3053.1153 | 84.664 | 9.66 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.766 | 202] 1.5 [DL + RSX] | 3232.8678 | -86.7544 | -87.3075 |
| Bottom | 0.772 | 202] 1.5 [DL + RSX] | 3275.3802 | 86.2131 | 73.8214 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2735.2385 | 21.3387 | 43.5001 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2777.751 | 73.8214 | 43.6651 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3232.8678 | -87.3075 | 10.19 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3232.8678 | 21.3387 | 9.28 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3275.3802 | -3.7658 | 9.15 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3275.3802 | 73.8214 | 10.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.811 | 202] 1.5 [DL + RSX] | 3458.1223 | -87.6051 | -84.9049 |
| Bottom | 0.817 | 202] 1.5 [DL + RSX] | 3500.6347 | 87.1497 | 76.6588 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2902.7767 | 19.3825 | 43.6357 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2945.2891 | 76.6588 | 43.7862 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3458.1223 | -84.9049 | 10.79 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3458.1223 | 19.3825 | 9.88 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3500.6347 | -10.9216 | 9.88 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3500.6347 | 76.6588 | 10.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.834 | 202] 1.5 [DL + RSX] | 3682.9831 | -88.645 | -81.9756 |
| Bottom | 0.845 | 202] 1.5 [DL + RSX] | 3725.4955 | 88.1642 | 122.6213 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3070.3039 | 14.0292 | 56.9378 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3112.8163 | 122.6213 | 57.0718 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3682.9831 | -81.9756 | 11.37 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3682.9831 | 14.0292 | 10.43 | 6 |
| Bottom–Left | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 2357.8331 | -8.6556 | 6.67 | 6 |
| Botttom–Right | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 3725.4955 | 122.6213 | 12.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.872 | 202] 1.5 [DL + RSX] | 3907.9126 | -90.0577 | 50.2409 |
| Bottom | 0.937 | 202] 1.5 [DL + RSX] | 3950.4251 | 97.3974 | -285.7797 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3237.7057 | 50.2409 | -98.5616 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3280.2182 | -103.3844 | -98.6622 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3907.9126 | -35.0175 | 11.34 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3907.9126 | 50.2409 | 11.55 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3950.4251 | -285.7797 | 14.94 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.883 | 202] 1.5 [DL + RSX] | 4141.4454 | -159.3585 | 911.6468 |
| Bottom | 0.74 | 202] 1.5 [DL + RSX] | 4205.2141 | 153.3947 | 135.4806 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3391.105 | 911.6468 | -301.6427 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3454.8737 | 135.4806 | -301.7705 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4141.4454 | 911.6468 | 13.3 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4205.2141 | -81.7303 | 8.29 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4205.2141 | 135.4806 | 8.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.765 | 202] 1.5 [DL + RSX] | 4416.6769 | -155.1509 | -123.5613 |
| Bottom | 0.773 | 202] 1.5 [DL + RSX] | 4480.4456 | 156.082 | 120.026 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3603.6099 | 49.9654 | 68.7852 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3667.3786 | 171.8656 | 69.1401 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4416.6769 | -123.5613 | 8.94 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4416.6769 | 11.5634 | 8.25 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4480.4456 | -80.69 | 8.8 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4480.4456 | 120.026 | 9.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.789 | 202] 1.5 [DL + RSX] | 4690.2183 | -149.8084 | -137.6132 |
| Bottom | 0.801 | 202] 1.5 [DL + RSX] | 4753.987 | 152.6523 | 136.0159 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3772.9061 | 52.5777 | 79.7912 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3836.6748 | 200.4434 | 80.4017 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4690.2183 | -137.6132 | 9.54 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4690.2183 | 15.1879 | 8.78 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4753.987 | -53.381 | 9.13 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4753.987 | 136.0159 | 9.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.816 | 202] 1.5 [DL + RSX] | 4960.6285 | -147.658 | -116.1218 |
| Bottom | 0.829 | 202] 1.5 [DL + RSX] | 5024.3972 | 150.38 | 135.5581 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3939.6979 | 73.9175 | 72.7034 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4003.4666 | 207.3942 | 73.5222 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4960.6285 | -116.1218 | 9.9 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4960.6285 | 40.8522 | 9.44 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5024.3972 | -55.0643 | 9.64 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5024.3972 | 135.5581 | 10.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.846 | 202] 1.5 [DL + RSX] | 5227.9883 | -144.4682 | -110.1249 |
| Bottom | 0.861 | 202] 1.5 [DL + RSX] | 5291.7569 | 147.8561 | 141.0558 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4105.0587 | 68.0388 | 72.3639 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4168.8274 | 217.613 | 73.3173 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5237.0597 | -140.4827 | 10.57 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5237.0597 | 68.0388 | 10.12 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5300.8284 | -137.8745 | 10.67 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5300.8284 | 217.613 | 11.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.874 | 202] 1.5 [DL + RSX] | 5491.9261 | -140.191 | -98.0485 |
| Bottom | 0.892 | 202] 1.5 [DL + RSX] | 5555.6948 | 144.5483 | 154.1557 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4269.6675 | 61.9188 | 71.8725 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4333.4362 | 233.3644 | 72.8691 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5514.5917 | -129.9493 | 11.01 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5514.5917 | 61.9188 | 10.59 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5578.3604 | -151.2137 | 11.26 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5578.3604 | 233.3644 | 11.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.898 | 202] 1.5 [DL + RSX] | 5751.7852 | -134.6366 | -78.8984 |
| Bottom | 0.922 | 202] 1.5 [DL + RSX] | 5815.5539 | 140.4992 | 175.5836 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4434.266 | 62.2644 | 70.8008 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4498.0347 | 255.4169 | 71.7424 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5787.8244 | -122.1105 | 11.47 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5787.8244 | 62.2644 | 11.1 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5851.5931 | -171.0015 | 11.89 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5851.5931 | 255.4169 | 12.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.919 | 202] 1.5 [DL + RSX] | 6006.6812 | -126.7717 | -59.2403 |
| Bottom | 0.949 | 202] 1.5 [DL + RSX] | 6070.4498 | 133.4462 | 201.6696 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4599.8108 | 76.0635 | 67.9138 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4663.5794 | 281.1043 | 68.708 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6055.2441 | -127.0453 | 12 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6055.2441 | 76.0635 | 11.68 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6119.0128 | -205.3381 | 12.6 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6119.0128 | 281.1043 | 13.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.944 | 202] 1.5 [DL + RSX] | 6255.8666 | -119.1199 | -73.2208 |
| Bottom | 0.991 | 202] 1.5 [DL + RSX] | 6321.6596 | 139.3069 | 234.4944 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4827.5843 | 20.2136 | 64.2054 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4893.3773 | 234.4944 | 64.295 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6316.1035 | -157.0754 | 12.67 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6316.1035 | 104.0682 | 12.34 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6381.8965 | -266.4059 | 13.46 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6381.8965 | 301.6486 | 13.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.149 | 202] 1.5 [DL + RSX] | 6524.8551 | 264.6446 | -136.9055 |
| Bottom | 1.196 | 202] 1.5 [DL + RSX] | 6609.88 | 267.1444 | -379.9974 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5034.5555 | 78.535 | 66.4386 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5119.5804 | 372.1118 | 66.4942 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6594.3798 | -213.3486 | 13.53 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6594.3798 | 154.9781 | 13.17 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6679.4047 | -408.4249 | 14.89 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6679.4047 | 400.5393 | 14.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.143 | 202] 1.5 [DL + RSX] | 6787.306 | 230.042 | -262.3501 |
| Bottom | 1.197 | 202] 1.5 [DL + RSX] | 6868.6869 | 232.2339 | 568.5722 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5227.4814 | 203.4814 | 89.1599 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5308.8624 | 568.5722 | 89.169 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6873.4534 | -306.084 | 14.62 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6873.4534 | 247.2152 | 14.25 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6954.8344 | -481.9995 | 15.85 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6954.8344 | 592.6028 | 16.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.533 | 202] 1.5 [DL + RSX] | 767.7843 | -81.4355 | 171.5132 |
| Bottom | 0.42 | 203] 1.5 [DL + RSY] | 953.0641 | 83.7244 | 39.0323 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 767.7843 | 171.5132 | -65.7156 | 104.656 | 364.4821 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 810.2968 | 118.2742 | -65.935 | 105.6746 | 365.5007 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 965.8336 | -63.455 | 3.56 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 965.8336 | 171.5132 | 5.06 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1008.3461 | -52.7322 | 3.53 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1008.3461 | 118.2742 | 4.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.42 | 202] 1.5 [DL + RSX] | 1201.9136 | -60.0211 | -181.1528 |
| Bottom | 0.422 | 203] 1.5 [DL + RSY] | 1222.2656 | 76.1291 | 51.681 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1015.0783 | 45.6371 | 86.9049 | 110.5814 | 370.4075 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1057.5907 | 131.6778 | 87.5709 | 111.6 | 371.4261 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1201.9136 | -181.1528 | 5.85 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1201.9136 | 45.6371 | 3.97 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1244.426 | -38.9004 | 4 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1244.426 | 131.6778 | 5.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.466 | 203] 1.5 [DL + RSY] | 1446.765 | -78.3813 | -61.2883 |
| Bottom | 0.466 | 203] 1.5 [DL + RSY] | 1489.2774 | 77.7097 | 53.8458 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1258.4887 | 64.2649 | 87.2236 | 113.8052 | 373.6313 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1301.0012 | 139.6665 | 87.8536 | 114.8011 | 374.6271 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1438.0721 | -175.5265 | 6.43 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1438.0721 | 64.2649 | 4.89 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1480.5845 | -38.3807 | 4.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1480.5845 | 139.6665 | 6.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.498 | 203] 1.5 [DL + RSY] | 1712.8705 | -77.7112 | -55.2666 |
| Bottom | 0.505 | 203] 1.5 [DL + RSY] | 1755.383 | 77.7326 | 53.0796 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1499.4787 | 71.953 | 86.7854 | 119.4502 | 379.2763 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1541.9911 | 142.3046 | 87.3747 | 120.446 | 380.2721 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1674.7471 | -172.9404 | 7.05 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1674.7471 | 71.953 | 5.65 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1717.2595 | -42.5157 | 5.36 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1717.2595 | 142.3046 | 6.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.54 | 203] 1.5 [DL + RSY] | 1978.5326 | -78.2403 | -53.971 |
| Bottom | 0.546 | 203] 1.5 [DL + RSY] | 2021.045 | 78.2603 | 51.7457 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1738.3414 | 74.712 | 87.3449 | 132.239 | 392.0651 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1780.8538 | 145.0248 | 87.8699 | 133.2921 | 393.1182 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1978.5326 | -44.9026 | 6.12 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1912.5495 | 74.712 | 6.35 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1955.062 | -47.9384 | 6.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2021.045 | 51.7457 | 6.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.587 | 203] 1.5 [DL + RSY] | 2244.3529 | -78.8714 | -53.3692 |
| Bottom | 0.594 | 203] 1.5 [DL + RSY] | 2286.8653 | 79.0061 | 50.256 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1975.5372 | 77.034 | 87.9774 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2018.0496 | 148.2658 | 88.4523 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2244.3529 | -44.3213 | 6.85 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2152.0378 | 77.034 | 7.05 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2194.5502 | -53.6812 | 6.84 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2286.8653 | 50.256 | 7.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 203] 1.5 [DL + RSY] | 2510.8965 | -79.7525 | -52.5112 |
| Bottom | 0.624 | 203] 1.5 [DL + RSY] | 2553.4089 | 80.0294 | 48.9641 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2211.5176 | 79.5238 | 88.517 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2254.03 | 151.5875 | 88.9731 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2510.8965 | -43.5974 | 7.58 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2393.7395 | 79.5238 | 7.75 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2436.252 | -59.141 | 7.59 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2553.4089 | 48.9641 | 7.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.667 | 203] 1.5 [DL + RSY] | 2778.7231 | -80.7937 | -51.315 |
| Bottom | 0.675 | 203] 1.5 [DL + RSY] | 2821.2356 | 81.2505 | 47.7329 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2446.7792 | 81.797 | 88.8703 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2489.2916 | 154.6391 | 89.3307 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2778.7231 | -42.5422 | 8.31 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2638.1453 | 81.797 | 8.46 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2680.6577 | -64.4099 | 8.34 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2821.2356 | 47.7329 | 8.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.701 | 203] 1.5 [DL + RSY] | 3048.3863 | -82.0307 | -50.3282 |
| Bottom | 0.71 | 203] 1.5 [DL + RSY] | 3090.8988 | 82.7892 | 46.4063 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2681.8653 | 83.1884 | 89.0731 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2724.3778 | 157.7288 | 89.5382 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3048.3863 | -40.9269 | 9.04 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2885.7231 | 83.1884 | 9.17 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2928.2355 | -70.1717 | 9.11 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3090.8988 | 46.4063 | 9.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.753 | 203] 1.5 [DL + RSY] | 3320.4099 | -83.1908 | -50.3654 |
| Bottom | 0.762 | 203] 1.5 [DL + RSY] | 3362.9223 | 83.7979 | 47.7421 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2917.325 | 83.1051 | 89.6 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2959.8374 | 163.1209 | 90.0506 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3320.4099 | -38.4325 | 9.76 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3136.9082 | 83.1051 | 9.87 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3179.4207 | -74.0391 | 9.86 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3362.9223 | 47.7421 | 10 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.807 | 203] 1.5 [DL + RSY] | 3595.5118 | -85.7638 | -48.3833 |
| Bottom | 0.824 | 203] 1.5 [DL + RSY] | 3638.0243 | 88.0775 | 82.3214 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3153.9162 | 85.2918 | 102.3933 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3196.4286 | 209.8413 | 102.8155 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3595.5118 | -32.2914 | 10.44 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3392.3743 | 85.2918 | 10.61 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3434.8868 | -56.7312 | 10.33 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3638.0243 | 82.3214 | 11.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 203] 1.5 [DL + RSY] | 3873.8328 | -83.6535 | -7.375 |
| Bottom | 0.881 | 203] 1.5 [DL + RSY] | 3916.3452 | 79.8138 | -218.5229 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3391.725 | 112.4876 | -137.3232 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3434.2374 | -26.5449 | -137.577 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3873.8328 | -7.375 | 10.86 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3873.8328 | 5.1199 | 10.83 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3694.6598 | -383.1249 | 15.58 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2268.8803 | 55.389 | 7.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.731 | 203] 1.5 [DL + RSY] | 4135.4261 | -87.4634 | 880.9189 |
| Bottom | 0.641 | 203] 1.5 [DL + RSY] | 4199.1948 | 83.1637 | 78.7761 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3616.7001 | 936.8659 | -323.3612 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3680.4688 | 302.0991 | -323.4725 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4135.4261 | 880.9189 | 13.1 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3956.2426 | -176.089 | 8.41 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4199.1948 | 78.7761 | 8.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.656 | 203] 1.5 [DL + RSY] | 4410.6142 | -79.6776 | 1.7149 |
| Bottom | 0.666 | 203] 1.5 [DL + RSY] | 4474.3828 | 82.2928 | 1.4973 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3858.065 | 191.4326 | -95.056 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3921.8336 | 242.7943 | -95.5127 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4143.4845 | -167.1341 | 8.7 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4410.6142 | 22.5837 | 8.31 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4474.3828 | -20.1224 | 8.41 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4474.3828 | 1.4973 | 8.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.698 | 203] 1.5 [DL + RSY] | 4688.9115 | -79.2426 | -68.921 |
| Bottom | 0.705 | 203] 1.5 [DL + RSY] | 4752.6801 | 81.7065 | 1.0812 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4101.029 | 131.2912 | 109.0673 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4164.7976 | 269.3245 | 109.6427 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4688.9115 | -42.1354 | 8.94 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4399.5823 | 131.2912 | 8.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4463.351 | -248.9805 | 9.8 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4752.6801 | 19.2629 | 8.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.733 | 203] 1.5 [DL + RSY] | 4968.8851 | -78.1819 | -22.6982 |
| Bottom | 0.744 | 203] 1.5 [DL + RSY] | 5032.6538 | 81.2647 | 8.6075 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4345.1501 | 148.4062 | 105.5648 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4408.9187 | 285.019 | 106.2418 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4968.8851 | -22.6982 | 9.34 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4659.1044 | 148.4062 | 9.54 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4722.8731 | -251.871 | 10.3 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5032.6538 | 24.5404 | 9.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.772 | 203] 1.5 [DL + RSY] | 5250.6942 | -76.9685 | -16.0852 |
| Bottom | 0.783 | 203] 1.5 [DL + RSY] | 5314.4629 | 80.862 | 8.8144 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4591.1675 | 146.2958 | 103.3156 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4654.9361 | 298.9477 | 104.0829 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5250.6942 | -16.0852 | 9.82 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4922.0904 | 146.2958 | 10.02 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4985.8591 | -264.8045 | 10.87 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5314.4629 | 25.3288 | 10 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.811 | 203] 1.5 [DL + RSY] | 5534.3351 | -75.2844 | -13.2504 |
| Bottom | 0.823 | 203] 1.5 [DL + RSY] | 5598.1037 | 80.2809 | 9.4547 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4839.7195 | 133.3049 | 102.2116 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4903.4882 | 318.686 | 103.0323 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5534.3351 | -13.2504 | 10.33 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5188.5004 | 133.3049 | 10.43 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5252.269 | -283.629 | 11.48 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5598.1037 | 25.6023 | 10.52 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.851 | 203] 1.5 [DL + RSY] | 5819.8854 | -73.1188 | -8.8867 |
| Bottom | 0.862 | 203] 1.5 [DL + RSY] | 5883.6541 | 79.5761 | 12.8207 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5091.5784 | 119.8059 | 101.4508 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5155.3471 | 349.6848 | 102.2629 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5819.8854 | -8.8867 | 10.83 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5458.5058 | 119.8059 | 10.85 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5522.2745 | -308.9521 | 12.13 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5883.6541 | 27.9119 | 11.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.89 | 203] 1.5 [DL + RSY] | 6106.4179 | -69.7552 | -1.6467 |
| Bottom | 0.902 | 203] 1.5 [DL + RSY] | 6170.1866 | 77.7633 | -6.4899 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5346.7521 | 118.8549 | 95.4157 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5410.5208 | 379.6314 | 96.142 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6106.4179 | -1.6467 | 11.32 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5731.4206 | 118.8549 | 11.35 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6170.1866 | -6.4899 | 11.47 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6170.1866 | 7.8563 | 11.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.929 | 203] 1.5 [DL + RSY] | 6398.3143 | -67.7742 | -13.0856 |
| Bottom | 0.945 | 203] 1.5 [DL + RSY] | 6464.1074 | 82.2602 | 7.2827 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5609.8764 | 134.9977 | 98.1865 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5675.6694 | 453.3636 | 98.789 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6398.3143 | -13.0856 | 11.93 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6011.9484 | 134.9977 | 11.97 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6077.7415 | -393.223 | 13.68 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6077.7415 | 453.3636 | 14.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.098 | 203] 1.5 [DL + RSY] | 6684.312 | -226.0594 | -61.4474 |
| Bottom | 1.141 | 202] 1.5 [DL + RSX] | 6375.11 | 213.7216 | 796.6248 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5874.2629 | 184.5189 | 141.0648 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5959.2878 | 796.6248 | 141.4871 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6684.312 | -26.1313 | 12.54 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6290.0851 | 184.5189 | 12.79 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6375.11 | -702.751 | 16.14 | 6 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6769.3369 | 26.2313 | 12.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.106 | 203] 1.5 [DL + RSY] | 6975.3012 | -204.3777 | -53.366 |
| Bottom | 1.204 | 202] 1.5 [DL + RSX] | 6657.1344 | 193.0696 | 1218.039 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6146.3704 | 477.0489 | 182.1022 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6227.7514 | 1218.039 | 182.1824 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6975.3012 | -32.6164 | 13.12 | 6 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6575.7535 | 477.0489 | 15.12 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7056.6821 | -21.4118 | 13.2 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7056.6821 | 25.3107 | 13.22 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.485 | 202] 1.5 [DL + RSX] | 1096.8575 | 80.1611 | 173.7261 |
| Bottom | 0.404 | 202] 1.5 [DL + RSX] | 1139.3699 | -76.3312 | 41.2434 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 919.128 | 173.7261 | -61.6284 | 111.9458 | 371.7719 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 961.6405 | 41.2434 | -61.5506 | 112.9989 | 372.825 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1126.0853 | 163.1922 | 5.39 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1168.5977 | -30.8536 | 3.67 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1168.5977 | 48.8178 | 3.92 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.44 | 202] 1.5 [DL + RSX] | 1283.0035 | 79.9712 | -56.4124 |
| Bottom | 0.44 | 202] 1.5 [DL + RSX] | 1325.516 | -78.6712 | 52.4276 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1044.0181 | 26.7345 | 35.3959 | 115.0396 | 374.8656 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1086.5306 | 60.2113 | 35.8121 | 116.0927 | 375.9187 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1304.069 | -77.1223 | 4.69 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1304.069 | 26.7345 | 3.99 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1346.5814 | -24.912 | 4.09 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1346.5814 | 60.2113 | 4.58 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.472 | 202] 1.5 [DL + RSX] | 1473.32 | 83.4574 | -45.2209 |
| Bottom | 0.476 | 202] 1.5 [DL + RSX] | 1515.8325 | -81.7329 | 54.0748 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1199.1212 | 36.8693 | 34.3963 | 118.8817 | 378.7078 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1241.6337 | 65.263 | 34.7921 | 119.9348 | 379.7609 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1484.6649 | -72.6375 | 5.13 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1484.6649 | 36.8693 | 4.64 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1527.1773 | -26.1319 | 4.61 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1527.1773 | 65.263 | 5.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.503 | 202] 1.5 [DL + RSX] | 1666.9539 | 85.2356 | -44.7585 |
| Bottom | 0.508 | 202] 1.5 [DL + RSX] | 1709.4664 | -83.8177 | 53.9761 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1354.6857 | 38.2495 | 33.764 | 122.7353 | 382.5614 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1397.1982 | 66.746 | 34.1707 | 123.7884 | 383.6145 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1666.9539 | -44.7585 | 5.25 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1666.9539 | 10.9548 | 4.78 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1709.4664 | -14.385 | 4.95 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1709.4664 | 53.9761 | 5.5 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 900 | 0.0025 | 0.0026 | 205] 1.2 [DL + LL + RSY] | 1649.0224 | 31.5052 | -62.7464 | 360000 |
| Bottom | 900 | 0.0025 | 0.0026 | 205] 1.2 [DL + LL + RSY] | 1683.0323 | -39.8535 | -17.3358 | 360000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1510.542 | 37.7362 | 34.1671 | 118.5646 | 378.3907 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1553.0545 | 67.9836 | 34.5819 | 119.5509 | 379.377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1849.6584 | -73.4867 | 6.16 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1863.6991 | 10.0955 | 5.32 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1906.2115 | -13.5664 | 5.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1906.2115 | 54.0364 | 6.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.577 | 202] 1.5 [DL + RSX] | 2063.5958 | 88.6925 | -46.9106 |
| Bottom | 0.583 | 202] 1.5 [DL + RSX] | 2106.1082 | -87.3414 | 54.185 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1666.7367 | 36.5455 | 34.6982 | 130.4653 | 390.2913 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1709.2491 | 69.31 | 35.1147 | 131.5184 | 391.3444 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2063.5958 | -46.9106 | 6.38 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2032.9562 | 36.5455 | 6.15 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2106.1082 | -12.2893 | 6.02 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2106.1082 | 54.185 | 6.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 202] 1.5 [DL + RSX] | 2266.6279 | 90.0369 | -47.9808 |
| Bottom | 0.621 | 202] 1.5 [DL + RSX] | 2309.1403 | -88.7759 | 54.3016 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1823.2585 | 34.6345 | 35.2699 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1865.7709 | 70.9716 | 35.6682 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2266.6279 | -47.9808 | 6.96 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2266.6279 | 8.0039 | 6.41 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2309.1403 | -10.5554 | 6.56 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2309.1403 | 54.3016 | 7.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.654 | 202] 1.5 [DL + RSX] | 2472.7015 | 91.0896 | -49.014 |
| Bottom | 0.66 | 202] 1.5 [DL + RSX] | 2515.214 | -89.9908 | 54.3682 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1980.0534 | 32.0509 | 35.8614 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2022.5659 | 73.1988 | 36.2193 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2472.7015 | -49.014 | 7.55 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2472.7015 | 6.7786 | 6.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2515.214 | -8.3556 | 7.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2515.214 | 54.3682 | 7.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.691 | 202] 1.5 [DL + RSX] | 2681.6596 | 91.764 | -49.9799 |
| Bottom | 0.698 | 202] 1.5 [DL + RSX] | 2724.172 | -90.8059 | 53.6197 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2137.0248 | 28.9983 | 36.1904 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2179.5372 | 75.2553 | 36.4951 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2681.6596 | -49.9799 | 8.14 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2681.6596 | 5.329 | 7.52 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2724.172 | -6.2565 | 7.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2724.172 | 53.6197 | 8.31 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.73 | 202] 1.5 [DL + RSX] | 2893.353 | 92.2727 | -51.8284 |
| Bottom | 0.737 | 202] 1.5 [DL + RSX] | 2935.8655 | -92.1564 | 52.4704 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2294.0797 | 25.0132 | 36.8203 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2336.5921 | 78.1166 | 37.0728 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2893.353 | -51.8284 | 8.76 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2893.353 | 3.1695 | 8.08 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2935.8655 | -1.9562 | 8.18 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2935.8655 | 52.4704 | 8.88 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.727 | 202] 1.5 [DL + RSX] | 3107.198 | 90.7228 | -54.765 |
| Bottom | 0.738 | 202] 1.5 [DL + RSX] | 3149.7104 | -89.6669 | 85.3753 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2450.7926 | 21.7262 | 50.165 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2493.305 | 120.9608 | 50.364 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3107.198 | -54.765 | 9.39 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3107.198 | 3.0698 | 8.67 | 6 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1892.7028 | -23.2018 | 5.58 | 6 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3149.7104 | 85.3753 | 9.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.768 | 202] 1.5 [DL + RSX] | 3321.5449 | 93.0658 | 40.8852 |
| Bottom | 0.825 | 202] 1.5 [DL + RSX] | 3364.0574 | -99.503 | -206.3933 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2410.4797 | 40.8852 | -78.6946 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2452.9921 | -123.0305 | -78.6798 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3321.5449 | -22.6627 | 9.54 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3321.5449 | 40.8852 | 9.79 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3364.0574 | -123.0305 | 11.05 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.839 | 202] 1.5 [DL + RSX] | 3579.1652 | 174.8064 | 778.9529 |
| Bottom | 0.684 | 202] 1.5 [DL + RSX] | 3642.9338 | -164.3985 | 69.3448 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2551.7149 | 778.9529 | -236.9259 | 200.6707 | 590.4098 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2615.4836 | 69.3448 | -236.9065 | 202.2799 | 592.0191 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3579.1652 | 778.9529 | 11.44 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3407.1606 | -96.4786 | 6.91 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3642.9338 | 69.3448 | 7.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 202] 1.5 [DL + RSX] | 3858.4401 | 143.4588 | -90.7978 |
| Bottom | 0.686 | 202] 1.5 [DL + RSX] | 3922.2087 | -148.5424 | 48.1872 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2979.7976 | 63.2285 | 48.7171 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3043.5662 | 158.0262 | 48.9591 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3858.4401 | -90.7978 | 7.71 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3858.4401 | 18.3943 | 7.26 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3922.2087 | -20.3333 | 7.39 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3922.2087 | 48.1872 | 7.56 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.716 | 202] 1.5 [DL + RSX] | 4133.0006 | 147.9323 | -92.4837 |
| Bottom | 0.72 | 202] 1.5 [DL + RSX] | 4196.7693 | -148.5386 | 67.0743 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3167.232 | 47.9628 | 63.4443 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3231.0007 | 184.8917 | 64.0425 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4133.0006 | -24.924 | 7.81 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3819.804 | 47.9628 | 7.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3883.5727 | -112.9576 | 7.89 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4196.7693 | 67.0743 | 8.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 202] 1.5 [DL + RSX] | 4405.5711 | 144.0035 | -65.6736 |
| Bottom | 0.748 | 202] 1.5 [DL + RSX] | 4469.3397 | -145.9021 | 63.9835 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3351.8315 | 70.3832 | 54.6693 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3415.6002 | 188.7681 | 55.4915 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4405.5711 | -1.1535 | 8.17 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4049.6059 | 70.3832 | 7.93 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4113.3746 | -115.0083 | 8.33 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4469.3397 | 63.9835 | 8.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.766 | 202] 1.5 [DL + RSX] | 4674.7992 | 139.9739 | -60.432 |
| Bottom | 0.777 | 202] 1.5 [DL + RSX] | 4738.5679 | -142.6785 | 57.6801 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3532.8382 | 69.029 | 51.8809 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3596.6069 | 192.0728 | 52.8157 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4674.7992 | -60.432 | 9.03 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4674.7992 | 3.2442 | 8.68 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4337.1323 | -124.767 | 8.8 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4738.5679 | 57.6801 | 9.13 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.793 | 202] 1.5 [DL + RSX] | 4939.9163 | 134.6495 | -58.9992 |
| Bottom | 0.806 | 202] 1.5 [DL + RSX] | 5003.685 | -138.6749 | 54.9993 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3710.2834 | 65.8496 | 51.2861 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3774.0521 | 203.5173 | 52.2478 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4939.9163 | -58.9992 | 9.51 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4939.9163 | 2.862 | 9.17 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4554.3161 | -139.1247 | 9.29 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5003.685 | 54.9993 | 9.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.817 | 202] 1.5 [DL + RSX] | 5199.7536 | 127.1753 | -57.0661 |
| Bottom | 0.831 | 202] 1.5 [DL + RSX] | 5263.5222 | -131.8915 | 63.8466 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3884.0361 | 73.1049 | 52.331 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3947.8048 | 230.2145 | 53.2185 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5199.7536 | -57.0661 | 9.98 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5199.7536 | 5.1493 | 9.66 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4764.2556 | -155.5235 | 9.78 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5263.5222 | 63.8466 | 10.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.84 | 202] 1.5 [DL + RSX] | 5453.2003 | 120.3016 | -51.5981 |
| Bottom | 0.866 | 202] 1.5 [DL + RSX] | 5516.969 | -131.9527 | 86.3246 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4054.7292 | 102.4135 | 53.6901 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4118.4979 | 274.2688 | 54.4202 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5453.2003 | -51.5981 | 10.42 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5453.2003 | 17.4193 | 10.21 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4967.2461 | -181.3501 | 10.32 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5516.969 | 86.3246 | 10.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.841 | 202] 1.5 [DL + RSX] | 5695.353 | 93.5648 | 41.1316 |
| Bottom | 0.9 | 202] 1.5 [DL + RSX] | 5761.1461 | 131.0999 | -120.8514 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4217.3529 | 155.2101 | -52.1625 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4283.146 | 228.4355 | -52.7285 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5695.353 | -50.0084 | 10.86 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5695.353 | 41.1316 | 10.8 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5761.1461 | -120.8514 | 11.41 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5761.1461 | 9.7869 | 10.73 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.122 | 202] 1.5 [DL + RSX] | 6187.5655 | 275.6557 | 85.4474 |
| Bottom | 1.151 | 202] 1.5 [DL + RSX] | 6272.5904 | 278.1554 | -195.2625 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4640.6359 | 204.7613 | -69.3986 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4725.6608 | 279.8145 | -69.7393 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6187.5655 | -18.2524 | 11.57 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6187.5655 | 85.4474 | 11.99 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6272.5904 | -195.2625 | 12.82 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6272.5904 | 34.4999 | 11.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.111 | 202] 1.5 [DL + RSX] | 6723.6529 | -225.7959 | 139.8799 |
| Bottom | 1.136 | 202] 1.5 [DL + RSX] | 6805.0339 | 227.9878 | 225.6912 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5127.2815 | 327.4238 | 65.0664 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5208.6625 | 593.8112 | 65.1254 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6723.6529 | -70.2184 | 12.88 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6723.6529 | 139.8799 | 13.31 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6212.6303 | -512.6258 | 14.67 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6212.6303 | 593.8112 | 15.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.486 | 202] 1.5 [DL + RSX] | 1124.4175 | -80.0431 | 172.1089 |
| Bottom | 0.403 | 202] 1.5 [DL + RSX] | 1166.9299 | 75.7205 | 35.5668 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 946.688 | 172.1089 | -61.1487 | 112.6285 | 372.4546 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 989.2005 | 35.5668 | -61.0588 | 113.6816 | 373.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1179.5923 | 163.8929 | 5.55 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1222.1047 | -34.804 | 3.88 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1222.1047 | 46.6824 | 4.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.443 | 202] 1.5 [DL + RSX] | 1312.9012 | -79.1963 | -59.9187 |
| Bottom | 0.441 | 202] 1.5 [DL + RSX] | 1355.4136 | 77.8381 | 51.2296 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1046.3818 | 23.2106 | 38.4301 | 115.0981 | 374.9242 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1088.8943 | 62.6323 | 38.8426 | 116.1512 | 375.9773 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1363.8428 | -84.1423 | 4.96 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1363.8428 | 23.2106 | 4.11 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1406.3553 | -24.8567 | 4.25 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1406.3553 | 62.6323 | 4.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.474 | 202] 1.5 [DL + RSX] | 1505.9235 | -82.7878 | -44.5459 |
| Bottom | 0.477 | 202] 1.5 [DL + RSX] | 1548.436 | 80.9981 | 52.7906 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1202.1993 | 37.1475 | 36.1631 | 118.9579 | 378.784 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1244.7117 | 67.6843 | 36.5564 | 120.011 | 379.8371 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1550.9838 | -75.606 | 5.36 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1550.9838 | 37.1475 | 4.82 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1593.4962 | -26.2204 | 4.79 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1593.4962 | 67.6843 | 5.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.505 | 202] 1.5 [DL + RSX] | 1702.5173 | -84.4399 | -44.2492 |
| Bottom | 0.51 | 202] 1.5 [DL + RSX] | 1745.0297 | 83.0552 | 52.6209 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1358.373 | 38.523 | 35.6366 | 122.8266 | 382.6527 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1400.8855 | 69.0752 | 36.0494 | 123.8797 | 383.7058 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1739.7618 | -75.2807 | 5.88 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1739.7618 | 38.523 | 5.37 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1782.2742 | -27.1637 | 5.33 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1782.2742 | 69.0752 | 5.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 202] 1.5 [DL + RSX] | 1902.4043 | -86.1941 | -45.4449 |
| Bottom | 0.549 | 202] 1.5 [DL + RSX] | 1944.9168 | 84.8712 | 52.717 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1514.6756 | 38.016 | 36.1994 | 126.6985 | 386.5246 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1557.188 | 70.3782 | 36.6252 | 127.7516 | 387.5777 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1929.3658 | -76.8737 | 6.43 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1929.3658 | 38.016 | 5.89 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1971.8782 | -27.3741 | 5.86 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1971.8782 | 70.3782 | 6.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.582 | 202] 1.5 [DL + RSX] | 2105.6204 | -87.7006 | -46.5345 |
| Bottom | 0.588 | 202] 1.5 [DL + RSX] | 2148.1329 | 86.4618 | 52.8459 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1671.151 | 36.863 | 36.8401 | 130.5746 | 390.4007 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1713.6634 | 71.8189 | 37.2683 | 131.6277 | 391.4538 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2119.4456 | -77.7765 | 6.97 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2119.4456 | 36.863 | 6.4 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2161.9581 | -27.2846 | 6.38 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2161.9581 | 71.8189 | 7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.621 | 202] 1.5 [DL + RSX] | 2312.1574 | -88.9801 | -47.6871 |
| Bottom | 0.627 | 202] 1.5 [DL + RSX] | 2354.6699 | 87.8484 | 52.8943 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1827.8114 | 34.9129 | 37.5207 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1870.3238 | 73.7002 | 37.9277 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2312.1574 | -47.6871 | 7.08 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2312.1574 | 4.5952 | 6.49 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2354.6699 | -6.4843 | 6.63 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2354.6699 | 52.8943 | 7.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.659 | 202] 1.5 [DL + RSX] | 2521.941 | -89.9977 | -48.8457 |
| Bottom | 0.666 | 202] 1.5 [DL + RSX] | 2564.4535 | 89.0348 | 52.8526 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1984.6535 | 32.2755 | 38.2077 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2027.1659 | 76.2283 | 38.5694 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2521.941 | -48.8457 | 7.68 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2521.941 | 3.3586 | 7.05 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2564.4535 | -4.2181 | 7.18 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2564.4535 | 52.8526 | 7.86 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.698 | 202] 1.5 [DL + RSX] | 2734.8439 | -90.6787 | -49.9693 |
| Bottom | 0.704 | 202] 1.5 [DL + RSX] | 2777.3563 | 89.8607 | 52.071 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2141.6597 | 29.1984 | 38.6416 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2184.1722 | 78.6757 | 38.9461 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2734.8439 | -49.9693 | 8.29 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2734.8439 | 1.8572 | 7.62 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2777.3563 | -2.0363 | 7.74 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2777.3563 | 52.071 | 8.44 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 202] 1.5 [DL + RSX] | 2950.7527 | -91.2227 | -51.902 |
| Bottom | 0.744 | 202] 1.5 [DL + RSX] | 2993.2652 | 91.1829 | 50.9933 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2298.8441 | 25.309 | 39.2644 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2341.3565 | 81.6905 | 39.5135 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2950.7527 | -0.341 | 8.2 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2879.5772 | 25.309 | 8.35 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2922.0896 | -28.7735 | 8.52 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2993.2652 | 50.9933 | 9.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.737 | 202] 1.5 [DL + RSX] | 3169.1534 | -89.9203 | -54.8701 |
| Bottom | 0.747 | 202] 1.5 [DL + RSX] | 3211.6659 | 89.0225 | 84.1942 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2455.943 | 22.1736 | 53.1434 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2498.4554 | 125.9402 | 53.3446 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3169.1534 | -0.8284 | 8.81 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3068.2851 | 22.1736 | 8.83 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3110.7976 | -0.3621 | 8.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3211.6659 | 84.1942 | 10.09 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.778 | 202] 1.5 [DL + RSX] | 3388.2782 | -92.166 | 38.141 |
| Bottom | 0.834 | 202] 1.5 [DL + RSX] | 3430.7907 | 98.3196 | -208.0159 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2478.389 | 38.141 | -78.4879 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2520.9015 | -130.8377 | -78.4715 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3388.2782 | -22.7282 | 9.73 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3388.2782 | 38.141 | 9.94 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3430.7907 | -130.8377 | 11.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.843 | 202] 1.5 [DL + RSX] | 3655.1388 | -174.6991 | 778.3808 |
| Bottom | 0.695 | 202] 1.5 [DL + RSX] | 3718.9075 | 164.8295 | 78.029 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2627.6139 | 778.3808 | -232.8168 | 202.5861 | 592.3252 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2691.3826 | 78.029 | -232.7978 | 204.1953 | 593.9345 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3655.1388 | 778.3808 | 11.57 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3553.7566 | -97.7477 | 7.18 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3718.9075 | 78.029 | 7.37 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.688 | 202] 1.5 [DL + RSX] | 3942.9476 | -143.6945 | -92.8528 |
| Bottom | 0.697 | 202] 1.5 [DL + RSX] | 4006.7163 | 149.0117 | 51.5937 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2983.1292 | 65.7416 | 58.9144 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3046.8979 | 173.3714 | 59.2418 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3942.9476 | -92.8528 | 7.87 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3942.9476 | 14.3206 | 7.39 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4006.7163 | -9.558 | 7.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4006.7163 | 51.5937 | 7.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.727 | 202] 1.5 [DL + RSX] | 4225.4396 | -147.6907 | -96.3202 |
| Bottom | 0.731 | 202] 1.5 [DL + RSX] | 4289.2083 | 148.6834 | 67.7491 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3168.2471 | 47.8197 | 73.1441 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3232.0158 | 197.7137 | 73.7625 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4225.4396 | -28.2714 | 8 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3997.4631 | 47.8197 | 7.7 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4061.2318 | -116.244 | 8.24 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4289.2083 | 67.7491 | 8.36 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.75 | 202] 1.5 [DL + RSX] | 4505.6204 | -143.8008 | -71.4073 |
| Bottom | 0.76 | 202] 1.5 [DL + RSX] | 4569.3891 | 145.983 | 64.5402 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3350.2172 | 67.0585 | 64.5346 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3413.9859 | 201.2267 | 65.3485 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4505.6204 | -5.4064 | 8.38 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4241.351 | 67.0585 | 8.27 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4305.1197 | -118.864 | 8.71 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4569.3891 | 17.8225 | 8.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.78 | 202] 1.5 [DL + RSX] | 4782.1773 | -139.7565 | -65.558 |
| Bottom | 0.791 | 202] 1.5 [DL + RSX] | 4845.9459 | 142.7195 | 58.6413 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3528.3074 | 64.2435 | 61.2318 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3592.0761 | 204.293 | 62.1449 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4782.1773 | -0.4125 | 8.86 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4478.3067 | 64.2435 | 8.69 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4542.0753 | -129.323 | 9.21 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4845.9459 | 58.6413 | 9.34 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.808 | 202] 1.5 [DL + RSX] | 5054.3691 | -134.4661 | -63.2901 |
| Bottom | 0.82 | 202] 1.5 [DL + RSX] | 5118.1377 | 138.7619 | 57.3145 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3702.6082 | 58.8331 | 60.0445 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3766.3769 | 215.5261 | 60.9762 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5054.3691 | -0.3564 | 9.36 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4707.8042 | 58.8331 | 9.08 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4771.5729 | -144.6094 | 9.73 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5118.1377 | 57.3145 | 9.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.832 | 202] 1.5 [DL + RSX] | 5321 | -126.9271 | -60.4227 |
| Bottom | 0.847 | 202] 1.5 [DL + RSX] | 5384.7686 | 131.7444 | 68.3207 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3873.0701 | 63.7248 | 60.4355 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3936.8388 | 242.05 | 61.2918 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5321 | -60.4227 | 10.23 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5321 | 2.1213 | 9.87 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4992.8829 | -162.0787 | 10.25 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5384.7686 | 68.3207 | 10.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.857 | 202] 1.5 [DL + RSX] | 5580.9184 | -120.4498 | -54.0235 |
| Bottom | 0.884 | 202] 1.5 [DL + RSX] | 5644.6871 | 133.0556 | 88.6691 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4040.4608 | 92.4644 | 59.144 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4104.2295 | 280.2939 | 59.8515 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5580.9184 | -54.0235 | 10.67 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5580.9184 | 14.6616 | 10.43 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5206.2205 | -187.2247 | 10.8 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5644.6871 | 88.6691 | 11 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.859 | 202] 1.5 [DL + RSX] | 5828.6203 | -91.3118 | 35.2358 |
| Bottom | 0.923 | 202] 1.5 [DL + RSX] | 5894.4133 | -136.0282 | -129.3152 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4199.6314 | 141.8539 | -56.0618 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4265.4245 | 219.5332 | -56.6158 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5828.6203 | -51.4569 | 11.11 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5828.6203 | 35.2358 | 11.01 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5894.4133 | -129.3152 | 11.71 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5894.4133 | 2.8853 | 10.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.135 | 202] 1.5 [DL + RSX] | 6298.8017 | 274.9176 | 95.9296 |
| Bottom | 1.163 | 202] 1.5 [DL + RSX] | 6383.8266 | 277.4174 | -200.9444 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4601.7699 | 215.9121 | -72.5618 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4686.7948 | 278.5419 | -72.9008 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6298.8017 | -8.5743 | 11.72 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6298.8017 | 95.9296 | 12.26 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6383.8266 | -200.9444 | 13.06 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6383.8266 | 34.386 | 12.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.143 | 202] 1.5 [DL + RSX] | 6821.9051 | 239.3575 | 143.0353 |
| Bottom | 1.169 | 202] 1.5 [DL + RSX] | 6903.2861 | 241.5495 | 231.4442 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5076.2482 | 330.5033 | 65.6476 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5157.6291 | 599.4379 | 65.706 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6821.9051 | -73 | 13.08 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6821.9051 | 143.0353 | 13.52 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6418.2336 | -518.8467 | 15.09 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6418.2336 | 599.4379 | 15.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.524 | 203] 1.5 [DL + RSY] | 875.9932 | -96.6921 | -80.8354 |
| Bottom | 0.417 | 203] 1.5 [DL + RSY] | 1029.0988 | 82.702 | -31.8276 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 830.6025 | 46.2169 | 74.8712 | 106.1612 | 365.9873 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 873.1149 | 60.8149 | 75.0937 | 107.1798 | 367.0059 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1031.9771 | -192.4291 | 5.54 | 6 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1031.9771 | 46.2169 | 3.51 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1074.4896 | -112.1961 | 4.54 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1074.4896 | 60.8149 | 3.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.427 | 203] 1.5 [DL + RSY] | 1251.8828 | -74.1885 | 70.6286 |
| Bottom | 0.429 | 203] 1.5 [DL + RSY] | 1294.3953 | 75.9226 | -47.9554 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1070.4373 | 181.0682 | -85.4357 | 111.9078 | 371.7339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1112.9498 | 43.7148 | -86.1028 | 112.9265 | 372.7526 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1261.2509 | -46.1633 | 4.14 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1261.2509 | 181.0682 | 6.02 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1303.7633 | -127.7711 | 5.4 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1303.7633 | 43.7148 | 4.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.473 | 203] 1.5 [DL + RSY] | 1515.3689 | -78.3611 | 57.5856 |
| Bottom | 0.474 | 203] 1.5 [DL + RSY] | 1557.8813 | 77.6613 | -51.6838 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1306.7036 | 173.7393 | -85.6344 | 114.9346 | 374.7607 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1349.2161 | 42.1367 | -86.2633 | 115.9304 | 375.7565 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1490.9933 | -67.253 | 5.08 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1490.9933 | 173.7393 | 6.55 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1533.5058 | -137.0187 | 6.16 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1533.5058 | 42.1367 | 4.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.51 | 203] 1.5 [DL + RSY] | 1778.2138 | -77.9439 | 51.6408 |
| Bottom | 0.517 | 203] 1.5 [DL + RSY] | 1820.7262 | 77.9063 | -50.8298 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1540.7031 | 170.3439 | -85.1547 | 120.4158 | 380.2419 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1583.2156 | 45.6278 | -85.7437 | 121.4116 | 381.2377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1721.5274 | -75.8148 | 5.84 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1721.5274 | 170.3439 | 7.15 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1764.0398 | -140.3864 | 6.85 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1764.0398 | 45.6278 | 5.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.55 | 203] 1.5 [DL + RSY] | 2040.8486 | -78.641 | 50.1952 |
| Bottom | 0.557 | 203] 1.5 [DL + RSY] | 2083.361 | 78.6238 | -49.0944 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1772.6951 | 170.4266 | -85.6394 | 133.09 | 392.9161 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1815.2075 | 50.8086 | -86.1644 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1953.4323 | -79.2179 | 6.53 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2040.8486 | 50.1952 | 6.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2083.361 | -43.5388 | 6.39 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1995.9448 | 50.8086 | 6.25 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.597 | 203] 1.5 [DL + RSY] | 2303.8455 | -79.4318 | 49.2003 |
| Bottom | 0.604 | 203] 1.5 [DL + RSY] | 2346.3579 | 79.5459 | -47.4087 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2003.0998 | 171.2946 | -86.2382 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2045.6122 | 56.4682 | -86.7133 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2187.2281 | -81.8698 | 7.21 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2303.8455 | 49.2003 | 7.08 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2346.3579 | -42.9601 | 7.11 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2229.7405 | 56.4682 | 6.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.627 | 203] 1.5 [DL + RSY] | 2567.7404 | -80.4438 | 47.8632 |
| Bottom | 0.634 | 203] 1.5 [DL + RSY] | 2610.2528 | 80.7186 | -46.1769 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2232.3364 | 172.0829 | -86.7647 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2274.8489 | 61.9401 | -87.2211 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2423.395 | -84.5483 | 7.91 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2567.7404 | 47.8632 | 7.8 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2610.2528 | -42.0993 | 7.84 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2465.9074 | 61.9401 | 7.71 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 203] 1.5 [DL + RSY] | 2833.0618 | -81.5873 | 46.1692 |
| Bottom | 0.686 | 203] 1.5 [DL + RSY] | 2875.5742 | 82.058 | -45.075 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2460.8723 | 172.1031 | -87.1231 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2503.3847 | 67.3007 | -87.5837 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2662.3726 | -86.9102 | 8.6 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2833.0618 | 46.1692 | 8.51 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2875.5742 | -40.8898 | 8.56 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2704.885 | 67.3007 | 8.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.711 | 203] 1.5 [DL + RSY] | 3100.3279 | -82.8971 | 44.5489 |
| Bottom | 0.72 | 203] 1.5 [DL + RSY] | 3142.8403 | 83.6618 | -44.0586 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2689.2226 | 171.0069 | -87.3383 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2731.7351 | 73.2536 | -87.8036 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2904.5742 | -88.285 | 9.29 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3100.3279 | 44.5489 | 9.23 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3142.8403 | -38.9548 | 9.27 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2947.0866 | 73.2536 | 9.2 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.763 | 203] 1.5 [DL + RSY] | 3370.0315 | -84.1509 | 44.0283 |
| Bottom | 0.772 | 203] 1.5 [DL + RSY] | 3412.5439 | 84.8038 | -45.8475 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2917.9173 | 168.7458 | -87.7565 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2960.4297 | 77.9005 | -88.2075 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3150.3812 | -88.0241 | 9.97 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3370.0315 | 44.0283 | 9.97 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3412.5439 | -37.2695 | 10 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3192.8936 | 77.9005 | 9.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.816 | 203] 1.5 [DL + RSY] | 3642.818 | -86.6735 | 42.9752 |
| Bottom | 0.834 | 203] 1.5 [DL + RSY] | 3685.3305 | 88.8373 | -80.2237 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3147.6614 | 163.8089 | -100.7783 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3190.1739 | 61.2947 | -101.2018 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3400.3692 | -89.2316 | 10.68 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3642.818 | 42.9752 | 10.72 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3685.3305 | -65.8831 | 11.15 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3442.8817 | 61.2947 | 10.41 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.853 | 203] 1.5 [DL + RSY] | 3918.8758 | -85.0512 | -7.0639 |
| Bottom | 0.892 | 203] 1.5 [DL + RSY] | 3961.3882 | 81.5984 | 218.5277 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3378.5956 | 113.2174 | 138.2683 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3421.1081 | 382.526 | 138.5217 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3918.8758 | -7.0639 | 10.98 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3918.8758 | 5.1603 | 10.96 | 6 |
| Bottom–Left | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 2273.4424 | -56.1249 | 7.09 | 6 |
| Botttom–Right | Leg 1 | 450 | 206] [0.9 DL + 1.5 RSX] | 3697.08 | 382.526 | 15.58 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.747 | 203] 1.5 [DL + RSY] | 4186.1675 | -91.2778 | -897.8224 |
| Bottom | 0.652 | 203] 1.5 [DL + RSY] | 4249.9362 | 86.7448 | -83.5634 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3604.3207 | -639.9326 | 321.0702 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3668.0893 | 171.3371 | 321.1693 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4186.1675 | -676.7607 | 11.93 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4249.9362 | -51.503 | 8.19 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3961.5943 | 171.3371 | 8.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.667 | 203] 1.5 [DL + RSY] | 4467.2792 | -81.706 | -32.8346 |
| Bottom | 0.675 | 203] 1.5 [DL + RSY] | 4531.0478 | 84.6022 | -10.1849 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3846.876 | 161.4593 | 92.5141 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3910.6446 | 251.4401 | 92.9728 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4467.2792 | -0.3423 | 8.27 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4152.5822 | 161.4593 | 8.69 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4531.0478 | -10.1849 | 8.45 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4531.0478 | 11.4752 | 8.46 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.707 | 203] 1.5 [DL + RSY] | 4751.0062 | -81.6606 | 55.2695 |
| Bottom | 0.714 | 203] 1.5 [DL + RSY] | 4814.7749 | 83.9616 | -6.3691 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4090.6248 | 232.619 | -106.9778 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4154.3935 | 240.9894 | -107.5559 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4411.8496 | -139.5546 | 9.03 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4751.0062 | 55.2695 | 9.14 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4814.7749 | -6.3691 | 8.96 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4475.6183 | 240.9894 | 9.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.743 | 203] 1.5 [DL + RSY] | 5036.0855 | -80.3263 | 18.6541 |
| Bottom | 0.754 | 203] 1.5 [DL + RSY] | 5099.8542 | 83.2863 | -13.4726 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4335.3279 | 211.0666 | -103.6422 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4399.0966 | 245.4409 | -104.3219 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4674.1731 | -155.0717 | 9.61 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5036.0855 | 37.3408 | 9.56 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5099.8542 | -13.4726 | 9.53 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4737.9417 | 245.4409 | 10.29 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.783 | 203] 1.5 [DL + RSY] | 5322.6074 | -78.8814 | 12.1252 |
| Bottom | 0.794 | 203] 1.5 [DL + RSY] | 5386.3761 | 82.5981 | -14.1786 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4581.6744 | 191.9392 | -101.6046 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4645.4431 | 259.2708 | -102.3746 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4939.5688 | -151.7892 | 10.08 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5322.6074 | 28.0248 | 10.03 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5386.3761 | -14.1786 | 10.06 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5003.3374 | 259.2708 | 10.87 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.823 | 203] 1.5 [DL + RSY] | 5610.5153 | -76.9757 | 9.3873 |
| Bottom | 0.834 | 203] 1.5 [DL + RSY] | 5674.284 | 81.8859 | -14.0209 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4830.2871 | 171.9741 | -100.6386 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4894.0558 | 278.7178 | -101.462 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5207.9975 | -138.3343 | 10.5 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5610.5153 | 24.2525 | 10.54 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5674.284 | -14.0209 | 10.59 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5271.7662 | 278.7178 | 11.48 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 203] 1.5 [DL + RSY] | 5899.8033 | -74.2203 | 4.9231 |
| Bottom | 0.874 | 203] 1.5 [DL + RSY] | 5963.572 | 80.0072 | -14.3985 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5081.9173 | 150.3447 | -99.9038 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5145.686 | 304.5407 | -100.7187 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5479.6038 | -124.8177 | 10.92 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5899.8033 | 20.6039 | 11.05 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5963.572 | -14.3985 | 11.13 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5543.3725 | 304.5407 | 12.15 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.902 | 203] 1.5 [DL + RSY] | 6189.5037 | -71.6937 | -3.5744 |
| Bottom | 0.915 | 203] 1.5 [DL + RSY] | 6253.2724 | 81.7117 | 7.2964 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5336.5997 | 137.2327 | -94.191 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5400.3684 | 371.7733 | -94.9209 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6189.5037 | -3.5744 | 11.48 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6189.5037 | 16.5531 | 11.56 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6253.2724 | -18.4574 | 11.69 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6253.2724 | 7.2964 | 11.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.94 | 203] 1.5 [DL + RSY] | 6483.6748 | -63.0555 | 3.513 |
| Bottom | 0.95 | 203] 1.5 [DL + RSY] | 6549.4679 | 66.5555 | -17.9469 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5598.9109 | 175.2044 | -96.4923 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5664.704 | 389.8977 | -97.0939 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6034.7633 | -141.6018 | 12.05 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6483.6748 | 30.0897 | 12.19 | 6 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6100.5564 | -455.3783 | 14.11 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6100.5564 | 389.8977 | 13.7 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.109 | 203] 1.5 [DL + RSY] | 6734.5833 | -230.9486 | 55.5308 |
| Bottom | 1.137 | 202] 1.5 [DL + RSX] | 6362.7051 | 213.9698 | -778.7335 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5827.394 | 275.2243 | -135.829 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5912.4189 | 654.6734 | -136.2588 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6277.6802 | -188.41 | 12.79 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6734.5833 | 55.5308 | 12.81 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6819.6082 | -46.4502 | 12.92 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6362.7051 | 654.6734 | 15.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.116 | 203] 1.5 [DL + RSY] | 7021.6316 | -207.5487 | 53.6488 |
| Bottom | 1.203 | 202] 1.5 [DL + RSX] | 6642.0043 | 194.2403 | -1208.7053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6099.3162 | 604.6696 | -169.1918 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6180.6971 | 1196.4278 | -169.2728 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6560.6233 | -520.3225 | 15.36 | 6 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7021.6316 | 53.6488 | 13.33 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7103.0126 | -29.0093 | 13.33 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7103.0126 | 16.7318 | 13.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.528 | 202] 1.5 [DL + RSX] | 1433.7011 | 80.2849 | 210.7601 |
| Bottom | 0.435 | 202] 1.5 [DL + RSX] | 1476.2135 | -73.6856 | -25.4059 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1332.8043 | 215.8005 | -75.9917 | 122.1932 | 382.0193 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1375.3168 | 33.9811 | -75.9228 | 123.2463 | 383.0724 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1476.2516 | 215.8005 | 7.1 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1518.764 | -37.8945 | 4.75 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1518.764 | 33.9811 | 4.69 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.488 | 202] 1.5 [DL + RSX] | 1648.2498 | 72.6199 | -108.5167 |
| Bottom | 0.478 | 202] 1.5 [DL + RSX] | 1690.7622 | -72.852 | 57.896 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1499.8657 | -17.6794 | 51.0931 | 126.3316 | 386.1577 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1542.3782 | 73.8567 | 51.1986 | 127.3847 | 387.2108 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1689.893 | -114.1638 | 6.28 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1051.9413 | 8.6892 | 3.04 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1732.4055 | -11.9552 | 4.98 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1732.4055 | 73.8567 | 5.84 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.522 | 202] 1.5 [DL + RSX] | 1867.785 | 75.6702 | -84.2805 |
| Bottom | 0.521 | 202] 1.5 [DL + RSX] | 1910.2975 | -74.4961 | 62.1148 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1668.4089 | 13.8809 | 42.8791 | 130.5067 | 390.3328 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1710.9213 | 81.6804 | 43.048 | 131.5598 | 391.3859 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1904.5452 | -87.3405 | 6.5 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1904.5452 | 13.8809 | 5.48 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1947.0577 | -10.6653 | 5.56 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1947.0577 | 81.6804 | 6.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.565 | 202] 1.5 [DL + RSX] | 2089.1861 | 77.8294 | -82.8721 |
| Bottom | 0.565 | 202] 1.5 [DL + RSX] | 2131.6985 | -76.5092 | 62.9969 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1838.1446 | 19.1239 | 41.487 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1880.657 | 83.0595 | 41.7381 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2119.8303 | -85.0863 | 7.07 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2119.8303 | 19.1239 | 6.15 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2162.3427 | -12.1308 | 6.17 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2162.3427 | 83.0595 | 7.16 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.609 | 202] 1.5 [DL + RSX] | 2311.71 | 79.8638 | -84.4587 |
| Bottom | 0.609 | 202] 1.5 [DL + RSX] | 2354.2225 | -78.5673 | 64.6562 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2008.9815 | 19.4411 | 41.2054 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2051.4939 | 82.9285 | 41.5396 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2335.5538 | -85.7998 | 7.68 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2335.5538 | 19.4411 | 6.76 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2378.0662 | -12.5159 | 6.78 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2378.0662 | 82.9285 | 7.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.653 | 202] 1.5 [DL + RSX] | 2535.0211 | 81.6834 | -86.01 |
| Bottom | 0.652 | 202] 1.5 [DL + RSX] | 2577.5336 | -80.4947 | 66.5293 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2180.7443 | 19.0573 | 41.1097 | 133.7664 | 393.5925 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2223.2568 | 82.523 | 41.4892 | 133.7664 | 393.5925 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2551.5559 | -85.8976 | 8.28 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2551.5559 | 19.0573 | 7.35 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2594.0683 | -12.7196 | 7.38 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2594.0683 | 82.523 | 8.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.66 | 202] 1.5 [DL + RSX] | 2758.8694 | 83.3498 | -87.2493 |
| Bottom | 0.659 | 202] 1.5 [DL + RSX] | 2801.3818 | -82.2832 | 68.247 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2362.0592 | 20.1018 | 41.427 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2404.5716 | 68.247 | 41.5968 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2767.6871 | -85.2499 | 8.87 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2767.6871 | 18.1025 | 7.94 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2810.1996 | -13.3103 | 7.99 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2810.1996 | 82.6699 | 8.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.7 | 202] 1.5 [DL + RSX] | 2983.0271 | 84.8367 | -87.5455 |
| Bottom | 0.703 | 202] 1.5 [DL + RSX] | 3025.5396 | -83.9166 | 70.1399 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2527.0412 | 20.5645 | 42.1598 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2569.5536 | 70.1399 | 42.3326 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2983.7766 | -83.946 | 9.45 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2983.7766 | 16.965 | 8.52 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3026.289 | -14.3048 | 8.61 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3026.289 | 83.5857 | 9.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.76 | 202] 1.5 [DL + RSX] | 3207.249 | 86.1052 | -86.3464 |
| Bottom | 0.766 | 202] 1.5 [DL + RSX] | 3249.7614 | -85.444 | 72.191 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2692.0958 | 20.3069 | 42.5779 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2734.6082 | 72.191 | 42.7462 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3207.249 | -86.3464 | 10.11 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3207.249 | 20.3069 | 9.19 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3249.7614 | -4.5302 | 9.09 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3249.7614 | 72.191 | 10.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.804 | 202] 1.5 [DL + RSX] | 3431.2486 | 86.9398 | -84.2617 |
| Bottom | 0.811 | 202] 1.5 [DL + RSX] | 3473.7611 | -86.3863 | 74.9135 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2857.0555 | 17.9676 | 42.792 | 150.6816 | 410.5077 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2899.568 | 74.9135 | 42.9459 | 150.6816 | 410.5077 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3431.2486 | -84.2617 | 10.7 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3431.2486 | 17.9676 | 9.78 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3473.7611 | -11.6898 | 9.81 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3473.7611 | 74.9135 | 10.69 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.827 | 202] 1.5 [DL + RSX] | 3654.9019 | 87.9556 | -81.5752 |
| Bottom | 0.839 | 202] 1.5 [DL + RSX] | 3697.4143 | -87.5776 | 119.1618 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3022.0377 | 12.3648 | 55.6393 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3064.5501 | 119.1618 | 55.7771 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3654.9019 | -81.5752 | 11.29 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3654.9019 | 12.3648 | 10.32 | 6 |
| Bottom–Left | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 2345.0214 | -9.5268 | 6.65 | 6 |
| Botttom–Right | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 3697.4143 | 119.1618 | 11.93 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.864 | 202] 1.5 [DL + RSX] | 3878.7259 | 88.9351 | 46.8262 |
| Bottom | 0.929 | 202] 1.5 [DL + RSX] | 3921.2384 | -95.7365 | -287.6417 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3187.0235 | 46.8262 | -97.942 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3229.536 | -102.8188 | -98.0454 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3878.7259 | -36.6898 | 11.28 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3878.7259 | 46.8262 | 11.42 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3921.2384 | -287.6417 | 14.89 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.873 | 202] 1.5 [DL + RSX] | 4110.561 | 157.3336 | 899.0925 |
| Bottom | 0.734 | 202] 1.5 [DL + RSX] | 4174.3296 | -151.4892 | 143.3618 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3340.9228 | 899.0925 | -296.6853 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3404.6915 | 143.3618 | -296.8171 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4110.561 | 899.0925 | 13.16 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4174.3296 | -77.5456 | 8.21 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4174.3296 | 143.3618 | 8.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.758 | 202] 1.5 [DL + RSX] | 4384.0371 | 153.6034 | -119.3078 |
| Bottom | 0.767 | 202] 1.5 [DL + RSX] | 4447.8057 | -154.1918 | 125.1659 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3547.3847 | 57.2158 | 68.852 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3611.1533 | 177.9698 | 69.2539 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4384.0371 | -119.3078 | 8.86 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4384.0371 | 14.5831 | 8.21 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4447.8057 | -78.7825 | 8.72 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4447.8057 | 125.1659 | 9.01 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.783 | 202] 1.5 [DL + RSX] | 4655.8069 | 148.5612 | -135.2363 |
| Bottom | 0.795 | 202] 1.5 [DL + RSX] | 4719.5755 | -151.0528 | 139.0661 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3712.7396 | 57.7425 | 80.0366 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3776.5083 | 202.7753 | 80.7048 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4655.8069 | -135.2363 | 9.46 | 6 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4655.8069 | 16.3106 | 8.72 | 6 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4719.5755 | -53.2357 | 9.07 | 6 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4719.5755 | 139.0661 | 9.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.81 | 202] 1.5 [DL + RSX] | 4924.5611 | 146.4666 | -115.306 |
| Bottom | 0.823 | 202] 1.5 [DL + RSX] | 4988.3298 | -148.9173 | 138.0455 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3875.7033 | 76.6571 | 73.4683 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3939.4719 | 207.8926 | 74.3361 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4935.1542 | -151.5202 | 10.07 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4935.1542 | 76.6571 | 9.61 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4998.9228 | -125.7921 | 10.03 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4998.9228 | 207.8926 | 10.54 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.84 | 202] 1.5 [DL + RSX] | 5190.3866 | 143.3163 | -109.9222 |
| Bottom | 0.854 | 202] 1.5 [DL + RSX] | 5254.1553 | -146.464 | 143.3514 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4037.3261 | 68.9232 | 73.3565 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4101.0948 | 217.3044 | 74.3405 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5218.3392 | -142.1451 | 10.54 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5218.3392 | 68.9232 | 10.09 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5282.1079 | -136.966 | 10.63 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5282.1079 | 217.3044 | 11.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.867 | 202] 1.5 [DL + RSX] | 5452.9172 | 139.0544 | -98.1932 |
| Bottom | 0.885 | 202] 1.5 [DL + RSX] | 5516.6858 | -143.2244 | 156.2288 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4198.2909 | 61.036 | 72.9375 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4262.0596 | 232.7507 | 73.944 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5498.2839 | -130.6153 | 10.99 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5498.2839 | 61.036 | 10.56 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5562.0526 | -150.9534 | 11.23 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5562.0526 | 232.7507 | 11.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.892 | 202] 1.5 [DL + RSX] | 5711.5031 | 133.4359 | -79.4351 |
| Bottom | 0.915 | 202] 1.5 [DL + RSX] | 5775.2717 | -139.0189 | 177.4988 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4359.359 | 59.7298 | 71.9215 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4423.1277 | 254.8012 | 72.8565 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5773.9071 | -121.9758 | 11.45 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5773.9071 | 59.7298 | 11.06 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5837.6757 | -171.5597 | 11.87 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5837.6757 | 254.8012 | 12.38 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.913 | 202] 1.5 [DL + RSX] | 5965.2966 | 125.7754 | -60.5529 |
| Bottom | 0.943 | 202] 1.5 [DL + RSX] | 6029.0652 | -132.6985 | 204.19 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4521.604 | 72.3683 | 69.0522 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4585.3727 | 280.4918 | 69.8324 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6043.7234 | -126.5603 | 11.97 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6043.7234 | 72.3683 | 11.64 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6107.4921 | -206.3749 | 12.58 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6107.4921 | 280.4918 | 13.04 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 202] 1.5 [DL + RSX] | 6213.4559 | 117.0641 | -76.596 |
| Bottom | 0.98 | 202] 1.5 [DL + RSX] | 6279.249 | -135.1743 | 231.1286 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4779.072 | 19.7884 | 62.9861 | 204.4128 | 594.1519 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4844.8651 | 231.1286 | 63.0772 | 204.4128 | 594.1519 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6306.6268 | -156.5704 | 12.65 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6306.6268 | 99.7628 | 12.29 | 6 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6372.4199 | -268.2793 | 13.46 | 6 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6372.4199 | 296.3059 | 13.63 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.117 | 202] 1.5 [DL + RSX] | 6461.9021 | 249.6104 | -127.495 |
| Bottom | 1.165 | 202] 1.5 [DL + RSX] | 6546.927 | 252.1101 | -369.2287 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4968.1697 | 86.4752 | 56.0272 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5053.1946 | 336.3398 | 56.0845 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6567.7739 | -200.3245 | 13.4 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6567.7739 | 159.3047 | 13.15 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6652.7988 | -402.1301 | 14.8 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6652.7988 | 369.2412 | 14.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.112 | 202] 1.5 [DL + RSX] | 6686.4956 | 214.1828 | -292.4129 |
| Bottom | 1.161 | 202] 1.5 [DL + RSX] | 6767.8766 | 216.3747 | 565.8902 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5153.0988 | 244.9264 | 78.3164 | 228.3936 | 618.1327 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5234.4797 | 565.8902 | 78.3256 | 228.3936 | 618.1327 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6802.8384 | -335.6408 | 14.67 | 6 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6802.8384 | 288.1542 | 14.38 | 6 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6884.2194 | -489.8985 | 15.77 | 6 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6884.2194 | 599.9663 | 16.45 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 2192 | 0.0046 | 0.0023 | 203] 1.5 [DL + RSY] | 92.5235 | -72.586 | -76.2637 | 480000 |
| Bottom | 2356 | 0.0049 | 0.0023 | 203] 1.5 [DL + RSY] | 171.1603 | 79.9176 | 188.8262 | 480000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 60.4701 | 201.4525 | 139.5838 | 137.1375 | 483.5723 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 139.1069 | 381.5595 | 145.1546 | 144.7415 | 491.1763 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 457.0533 | -183.9273 | 1.91 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 457.0533 | 234.0193 | 2.17 | 6 |
| Bottom–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 519.9627 | -21.46 | 1.2 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 519.9627 | 318.1413 | 2.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 2039 | 0.0042 | 0.0023 | 207] [0.9 DL + 1.5 RSY] | 247.3427 | -73.0956 | -195.6123 | 480000 |
| Bottom | 1200 | 0.0025 | 0.0023 | 205] 1.2 [DL + LL + RSY] | 1092.2447 | -35.0764 | 82.0808 | 480000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 525.9383 | -97.3304 | 309.0847 | 144.8193 | 491.2541 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 579.0226 | 625.9311 | 311.6983 | 124.7933 | 471.2281 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1070.5677 | -143.4453 | 2.98 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 692.3966 | 24.1383 | 1.57 | 6 |
| Bottom–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1113.0352 | -338.2012 | 4.08 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1113.0352 | 541.7954 | 5.14 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.109 | 203] 1.5 [DL + RSY] | 1978.0908 | 5591.2418 | 2166.6149 |
| Bottom | 0.076 | 202] 1.5 [DL + RSX] | 3247.1906 | 2508.4665 | 4792.1738 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -18.7419 | 19.9516 | 51.3011 | 20.2814 | 78.0205 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 521.5737 | 382.7266 | 152.8452 | 205.9129 | 552.3477 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | -8.9217 | 442.6618 | -322.0604 | 325.0296 | 931.2904 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 100.6621 | 41.1899 | -24.1068 | 52.5814 | 168.0596 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | -52.0326 | 36.2807 | 180.4844 | 162.5148 | 465.6452 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -242.8762 | -52.2054 | 143.2439 | 193.47 | 554.3395 |
| Top | Leg 7 | 1100.25 | 202] 1.5 [DL + RSX] | -49.5058 | -0.3956 | -147.3361 | 20.2814 | 147.3361 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | -12.2211 | -8.2243 | 28.9229 | 52.5814 | 168.0596 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | -34.6406 | 457.3838 | -395.2872 | 325.0296 | 931.2904 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 307.2228 | 69.7125 | 200.1305 | 174.4025 | 477.5329 |
| Top | Leg 11 | 666.57 | 202] 1.5 [DL + RSX] | 355.4027 | 33.6038 | 97.2562 | 20.2814 | 97.2562 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | -214.9591 | -81.589 | 307.1585 | 162.5148 | 465.6452 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 747.3842 | -457.4551 | 97.3849 | 222.3893 | 583.2588 |
| Top | Leg 14 | OS | 205] 1.2 [DL + LL + RSY] | -271.2323 | 18.4856 | 319.056 | 20.2814 | 78.0205 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 25.4154 | 68.1254 | 352.4126 | 163.4982 | 466.6286 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -62.2078 | -2.7774 | 39.039 | 20.2814 | 78.0205 |
| Bottom | Leg 2 | 500 | 204] 1.2 [DL + LL + RSX] | 405.0507 | 105.7312 | 121.0177 | 201.4042 | 547.839 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 421.2331 | 462.3658 | -341.8981 | 341.3288 | 947.5896 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 12.0565 | 10.7933 | -26.8632 | 52.5814 | 168.0596 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 47.7691 | 58.4598 | -202.7668 | 164.3632 | 467.4936 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -195.2238 | 321.4029 | 133.4454 | 193.47 | 554.3395 |
| Bottom | Leg 7 | 1374.07 | 202] 1.5 [DL + RSX] | -51.0796 | 9.4415 | -178.957 | 20.2814 | 178.957 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | -5.891 | 23.9401 | 26.825 | 52.5814 | 168.0596 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 382.2999 | 432.9286 | -414.5259 | 339.8223 | 946.0831 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 316.8319 | 68.078 | -186.4091 | 174.7743 | 477.9047 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 8.6632 | -3.7113 | 42.1494 | 20.2814 | 78.0205 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 82.4246 | 60.6787 | -206.5484 | 165.7041 | 468.8346 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -51.5596 | 354.4157 | 142.7156 | 193.47 | 554.3395 |
| Bottom | Leg 14 | 744.13 | 202] 1.5 [DL + RSX] | 166.5989 | -35.3751 | 106.2122 | 20.2814 | 106.2122 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 244.5397 | 59.6587 | 387.3936 | 171.977 | 475.1074 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 0

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 232.5752 | -1.7027 | 3.23 | 6 |
| Top–Right | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 286.0335 | 19.9516 | 7.32 | 6 |
| Top–Left | Leg 2 | 0 | 205] 1.2 [DL + LL + RSY] | 1127.5214 | -43.287 | 2.57 | 6 |
| Top–Right | Leg 2 | 0 | 205] 1.2 [DL + LL + RSY] | 1127.5214 | 88.7869 | 2.81 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 207] [0.9 DL + 1.5 RSY] | 78.6688 | -59.2454 | 0.19 | 6 |
| Top–Right | Leg 3 | 0 | 207] [0.9 DL + 1.5 RSY] | 177.0127 | 403.8133 | 0.9 | 6 |
| Top–Left | Leg 4 | 0 | 204] 1.2 [DL + LL + RSX] | 139.2219 | -10.8075 | 1.38 | 6 |
| Top–Right | Leg 4 | 0 | 204] 1.2 [DL + LL + RSX] | 276.7494 | 16.6097 | 2.51 | 6 |
| Top–Left | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 90.8166 | -35.5805 | 0.46 | 6 |
| Top–Right | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 90.8166 | 27.5934 | 0.4 | 6 |
| Top–Left | Leg 6 | 0 | 204] 1.2 [DL + LL + RSX] | 342.068 | -75.334 | 1.05 | 6 |
| Top–Right | Leg 6 | 0 | 204] 1.2 [DL + LL + RSX] | 313.892 | 29.093 | 0.77 | 6 |
| Top–Left | Leg 7 | 0 | 205] 1.2 [DL + LL + RSY] | 57.8118 | -1.8088 | 1.06 | 6 |
| Top–Right | Leg 7 | 0 | 205] 1.2 [DL + LL + RSY] | 54.8915 | 2.9615 | 1.24 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 160.0853 | -28.5155 | 2.34 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 20.7148 | 5.4598 | 0.39 | 6 |
| Top–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 187.7199 | 407.271 | 0.92 | 6 |
| Top–Left | Leg 10 | 0 | 205] 1.2 [DL + LL + RSY] | 918.1443 | -108.0716 | 2.92 | 6 |
| Top–Right | Leg 10 | 0 | 205] 1.2 [DL + LL + RSY] | 789.0714 | 43.5299 | 2.17 | 6 |
| Top–Left | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 545.2726 | 33.6038 | 13.12 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 943.653 | -457.4551 | 4.08 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 55.2638 | -4.1419 | 0.16 | 6 |
| Top–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 50.0972 | 52.1237 | 0.47 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 70.7494 | -2.7774 | 1.41 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 69.0411 | 1.8045 | 1.2 | 6 |
| Bottom–Left | Leg 2 | 0 | 204] 1.2 [DL + LL + RSX] | 799.9271 | -36.6898 | 1.86 | 6 |
| Botttom–Right | Leg 2 | 0 | 204] 1.2 [DL + LL + RSX] | 799.9271 | 105.7312 | 2.22 | 6 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 547.7668 | -73.6037 | 0.78 | 6 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 629.2887 | 268.5192 | 1.21 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 69.3852 | -8.9508 | 0.85 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 49.2278 | 7.9718 | 0.68 | 6 |
| Bottom–Left | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 318.0227 | -44.44 | 1.06 | 6 |
| Botttom–Right | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 318.0227 | 48.4473 | 1.09 | 6 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 196.0922 | -11.3159 | 0.45 | 6 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 199.8963 | 296.3664 | 1.82 | 6 |
| Bottom–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 87.319 | -1.4457 | 1.36 | 6 |
| Botttom–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 96.3788 | 9.4415 | 2.98 | 6 |
| Bottom–Left | Leg 8 | 0 | 207] [0.9 DL + 1.5 RSY] | 40.1566 | -0.9324 | 0.29 | 6 |
| Botttom–Right | Leg 8 | 0 | 207] [0.9 DL + 1.5 RSY] | 48.3785 | 4.847 | 0.53 | 6 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 504.4228 | -23.9766 | 0.64 | 6 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 587.9332 | 263.8991 | 1.15 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 793.0116 | -46.6887 | 2.21 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 793.0116 | 68.078 | 2.35 | 6 |
| Bottom–Left | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 131.9718 | -3.7113 | 2.35 | 6 |
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 103.8448 | 1.2907 | 1.54 | 6 |
| Bottom–Left | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 342.6369 | -36.991 | 1.07 | 6 |
| Botttom–Right | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 342.6369 | 50.9909 | 1.16 | 6 |
| Bottom–Left | Leg 13 | 0 | 206] [0.9 DL + 1.5 RSX] | 259.8502 | -1.2878 | 0.53 | 6 |
| Botttom–Right | Leg 13 | 0 | 206] [0.9 DL + 1.5 RSX] | 311.9228 | 354.4157 | 2.33 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 253.4687 | -35.3751 | 9.8 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 336.9125 | -2.0811 | 0.82 | 6 |
| Botttom–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 336.9125 | 3.1286 | 0.82 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.095 | 203] 1.5 [DL + RSY] | 4678.189 | 4919.7479 | 1339.1844 |
| Bottom | 0.096 | 202] 1.5 [DL + RSX] | 4874.4969 | 1778.4319 | 6968.8146 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 30.5631 | 19.2919 | 50.204 | 20.4483 | 78.1874 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 233.4253 | 36.8902 | 60.7051 | 194.7633 | 541.1981 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 418.6497 | 471.3032 | -322.4303 | 341.2288 | 947.4897 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 48.3392 | 16.1582 | -15.2694 | 53.4958 | 168.9741 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 47.4049 | 40.8695 | -188.9657 | 164.3491 | 467.4795 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -19.7245 | 5.912 | 161.8287 | 193.47 | 554.3395 |
| Top | Leg 7 | 1367.59 | 202] 1.5 [DL + RSX] | -56.48 | -3.2835 | -178.3747 | 20.4483 | 178.3747 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 43.1096 | 25.3141 | -19.9612 | 53.4958 | 168.9741 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 388.2375 | 537.1479 | -374.1989 | 340.052 | 946.3129 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 306.252 | 68.0612 | -129.6957 | 174.3649 | 477.4953 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 65.8281 | 20.253 | 49.3685 | 20.4483 | 78.1874 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 89.4566 | 45.8775 | -212.4634 | 165.9762 | 469.1066 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 68.096 | 86.2202 | 169.2581 | 196.1049 | 556.9744 |
| Top | Leg 14 | 1327.51 | 202] 1.5 [DL + RSX] | 82.939 | 3.0593 | 173.7471 | 20.4483 | 173.7471 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 261.4684 | 41.7164 | 387.7202 | 172.632 | 475.7625 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -64.5376 | -0.9772 | 46.8243 | 20.4483 | 78.1874 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 277.1413 | 128.8704 | 78.8556 | 196.4549 | 542.8897 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 654.6653 | 500.016 | -297.1654 | 350.3612 | 956.622 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 45.2005 | 17.0088 | 15.1516 | 53.4958 | 168.9741 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 127.8297 | 78.6324 | 199.2455 | 167.461 | 470.5915 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -189.511 | 353.1156 | 155.7123 | 193.47 | 554.3395 |
| Bottom | Leg 7 | 1316.59 | 202] 1.5 [DL + RSX] | -11.788 | 13.8861 | -172.4853 | 20.4483 | 172.4853 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 58.4665 | 17.4941 | -18.9024 | 53.4958 | 168.9741 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 680.8265 | 463.9094 | -343.5429 | 351.3735 | 957.6343 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 261.5997 | 76.9979 | -127.8805 | 172.6371 | 475.7676 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -33.7308 | -2.0757 | 47.9123 | 20.4483 | 78.1874 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 167.1611 | 73.4942 | -207.8234 | 168.9829 | 472.1133 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 11.2145 | 264.2073 | 163.6359 | 193.9039 | 554.7735 |
| Bottom | Leg 14 | 1205.93 | 202] 1.5 [DL + RSX] | 3.8129 | 1.7731 | 159.7071 | 20.4483 | 159.7071 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 403.0363 | 80.6617 | -417.7547 | 178.1099 | 481.2403 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 245.4743 | -2.7661 | 3.59 | 6 |
| Top–Right | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 314.4836 | 19.2919 | 7.55 | 6 |
| Top–Left | Leg 2 | 0 | 205] 1.2 [DL + LL + RSY] | 839.9574 | -15.814 | 1.83 | 6 |
| Top–Right | Leg 2 | 0 | 205] 1.2 [DL + LL + RSY] | 839.9574 | 28.6417 | 1.9 | 6 |
| Top–Left | Leg 3 | 0 | 207] [0.9 DL + 1.5 RSY] | 355.6712 | -67.4451 | 0.54 | 6 |
| Top–Right | Leg 3 | 0 | 207] [0.9 DL + 1.5 RSY] | 636.9879 | 333.4838 | 1.33 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 175.1946 | -3.5262 | 1.26 | 6 |
| Top–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 175.1946 | 1.4623 | 1.16 | 6 |
| Top–Left | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 322.0321 | -27.3113 | 0.95 | 6 |
| Top–Right | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 322.0321 | 33.167 | 0.99 | 6 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 714.5513 | -297.6629 | 2.86 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 714.5513 | 5.912 | 1.46 | 6 |
| Top–Left | Leg 7 | 0 | 207] [0.9 DL + 1.5 RSY] | 35.0313 | -11.9792 | 2.68 | 6 |
| Top–Right | Leg 7 | 0 | 207] [0.9 DL + 1.5 RSY] | 35.0313 | 1.585 | 0.74 | 6 |
| Top–Left | Leg 8 | 0 | 204] 1.2 [DL + LL + RSX] | 104.3815 | -6.4965 | 0.96 | 6 |
| Top–Right | Leg 8 | 0 | 204] 1.2 [DL + LL + RSX] | 161.704 | 9.3287 | 1.45 | 6 |
| Top–Left | Leg 9 | 0 | 207] [0.9 DL + 1.5 RSY] | 361.0902 | -46.5431 | 0.51 | 6 |
| Top–Right | Leg 9 | 0 | 207] [0.9 DL + 1.5 RSY] | 627.6723 | 376.5347 | 1.39 | 6 |
| Top–Left | Leg 10 | 0 | 206] [0.9 DL + 1.5 RSX] | 558.9575 | -15.5139 | 1.44 | 6 |
| Top–Right | Leg 10 | 0 | 206] [0.9 DL + 1.5 RSX] | 851.7466 | 68.0612 | 2.49 | 6 |
| Top–Left | Leg 11 | 0 | 206] [0.9 DL + 1.5 RSX] | 260.9617 | -2.3295 | 3.7 | 6 |
| Top–Right | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 342.6592 | 20.253 | 8.08 | 6 |
| Top–Left | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 354.513 | -7.0886 | 0.89 | 6 |
| Top–Right | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 354.513 | 40.63 | 1.12 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 726.1359 | -214.3813 | 2.48 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 726.1359 | 86.2202 | 1.87 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 201.0942 | -10.1604 | 4.42 | 6 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 201.0942 | 3.0593 | 3.09 | 6 |
| Top–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 344.8972 | -0.7794 | 0.83 | 6 |
| Top–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 344.8972 | 1.6405 | 0.83 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 93.4007 | -0.9772 | 1.35 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 87.6281 | 2.8999 | 1.64 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 873.4978 | -112.5723 | 2.41 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 873.4978 | 128.8704 | 2.49 | 6 |
| Bottom–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 879.7363 | -109.8322 | 1.23 | 6 |
| Botttom–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 951.8613 | 223.4276 | 1.51 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 154.377 | -2.7848 | 1.1 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 154.377 | 0.3927 | 0.98 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 574.5725 | -66.8971 | 1.82 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 574.5725 | 78.6324 | 1.9 | 6 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 494.2826 | -20.2359 | 1.09 | 6 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 570.4755 | 353.1156 | 2.84 | 6 |
| Bottom–Left | Leg 7 | 0 | 207] [0.9 DL + 1.5 RSY] | 91.4498 | -0.9902 | 1.33 | 6 |
| Botttom–Right | Leg 7 | 0 | 207] [0.9 DL + 1.5 RSY] | 155.0974 | 13.8861 | 4.54 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 160.8302 | -2.4944 | 1.12 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 160.8302 | 0.0096 | 1.01 | 6 |
| Bottom–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 895.5247 | -93.8474 | 1.23 | 6 |
| Botttom–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 970.7802 | 209.6796 | 1.51 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 847.7092 | -86.799 | 2.61 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 847.7092 | 76.9979 | 2.54 | 6 |
| Bottom–Left | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 127.7924 | -2.0757 | 1.99 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 108.9801 | 2.1924 | 1.77 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 606.2098 | -72.6625 | 1.94 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 606.2098 | 73.4942 | 1.94 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 764.9685 | -43.2875 | 1.74 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 764.9685 | 264.2073 | 2.8 | 6 |
| Bottom–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 164.1866 | -8.2834 | 3.61 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 164.1866 | 1.7731 | 2.38 | 6 |
| Bottom–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 510.8573 | -1.9431 | 1.23 | 6 |
| Botttom–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 510.8573 | 3.8067 | 1.24 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.108 | 203] 1.5 [DL + RSY] | 6321.7863 | 4954.0898 | 956.838 |
| Bottom | 0.12 | 202] 1.5 [DL + RSX] | 6418.5325 | 1319.424 | 8913.4032 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 17.0877 | 19.4577 | 49.8791 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 306.5075 | 119.268 | -68.9034 | 197.5912 | 544.026 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 651.6435 | 495.4808 | -273.2039 | 350.2443 | 956.5051 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 88.156 | 21.7564 | -18.2419 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 125.9628 | 54.6261 | 203.7075 | 167.3888 | 470.5192 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -12.5583 | 26.7695 | 150.2944 | 193.47 | 554.3395 |
| Top | Leg 7 | 1308.92 | 202] 1.5 [DL + RSX] | -34.0659 | -0.5792 | -171.5149 | 20.3633 | 171.5149 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 91.4704 | 14.6503 | 15.8804 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 680.7332 | 535.1661 | -301.2442 | 351.3698 | 957.6307 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 288.5303 | 32.6453 | -91.3945 | 173.6792 | 476.8096 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 26.0634 | 19.7928 | 50.7002 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 167.9871 | 54.1086 | -205.723 | 169.0149 | 472.1453 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 99.2551 | 25.4853 | 146.4698 | 197.3106 | 558.1801 |
| Top | Leg 14 | 1118.77 | 202] 1.5 [DL + RSX] | -11.5386 | 12.9991 | 149.5568 | 20.3633 | 149.5568 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 413.9059 | 45.9263 | -422.4517 | 178.5305 | 481.6609 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -73.0201 | -0.5283 | 49.1531 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 312.3746 | 142.1127 | -68.1212 | 197.8182 | 544.253 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 875.5928 | 540.6447 | -256.9152 | 358.9097 | 965.1706 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 86.7418 | 14.7776 | -17.1445 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 185.4707 | 88.3314 | 205.3503 | 169.6914 | 472.8218 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -161.7036 | 331.9217 | 147.9885 | 193.47 | 554.3395 |
| Bottom | Leg 7 | 1276.75 | 202] 1.5 [DL + RSX] | -5.6305 | 12.6969 | -167.8002 | 20.3633 | 167.8002 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 101.0412 | 19.1131 | 15.0183 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 910.3174 | 506.7444 | -277.5016 | 360.2534 | 966.5142 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 257.3427 | 84.9579 | -78.9042 | 172.4724 | 475.6028 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -53.7163 | -1.4471 | 49.6195 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 217.0897 | 85.0954 | -203.6911 | 170.9148 | 474.0453 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -39.113 | 288.0294 | 142.2087 | 193.47 | 554.3395 |
| Bottom | Leg 14 | 1144.12 | 202] 1.5 [DL + RSX] | 6.6979 | -1.1441 | 152.4847 | 20.3633 | 152.4847 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 525.6029 | 96.5402 | -467.0468 | 182.8525 | 485.9829 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 261.2509 | -3.2378 | 3.87 | 6 |
| Top–Right | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 330.8356 | 19.4577 | 7.78 | 6 |
| Top–Left | Leg 2 | 0 | 203] 1.5 [DL + RSY] | 920.0251 | -16.1516 | 2 | 6 |
| Top–Right | Leg 2 | 0 | 203] 1.5 [DL + RSY] | 920.0251 | 31.3385 | 2.08 | 6 |
| Top–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 878.151 | -24.7645 | 1.09 | 6 |
| Top–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 952.354 | 269.2462 | 1.59 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 168.0883 | -11.3049 | 1.58 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 258.2168 | 6.8399 | 1.93 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 572.4162 | -47.733 | 1.69 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 572.4162 | 54.6261 | 1.73 | 6 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1010.3625 | -262.5488 | 3.28 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1010.3625 | 26.7695 | 2.15 | 6 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 88.55 | -0.5792 | 1.22 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 83.8266 | 0.4448 | 1.13 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 254.9752 | -0.4117 | 1.61 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 201.5525 | 0.3186 | 1.27 | 6 |
| Top–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 924.6221 | -12.6664 | 1.12 | 6 |
| Top–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1001.4246 | 310.0586 | 1.72 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 859.6455 | -49.7932 | 2.39 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 882.3555 | 32.6453 | 2.32 | 6 |
| Top–Left | Leg 11 | 0 | 206] [0.9 DL + 1.5 RSX] | 265.3616 | -2.9019 | 3.86 | 6 |
| Top–Right | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 338.2178 | 19.7928 | 7.94 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 608.8268 | -43.0044 | 1.74 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 608.8268 | 54.1086 | 1.82 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1087.9183 | -260.74 | 3.43 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1087.9183 | 25.4853 | 2.3 | 6 |
| Top–Left | Leg 14 | 0 | 206] [0.9 DL + 1.5 RSX] | 97.0017 | -1.7667 | 1.54 | 6 |
| Top–Right | Leg 14 | 0 | 206] [0.9 DL + 1.5 RSX] | 118.3675 | 12.9991 | 3.92 | 6 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 457.0422 | -28.7715 | 1.28 | 6 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 509.6646 | 4.7918 | 1.25 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 141.1666 | -0.5283 | 1.86 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 127.5373 | 3.3016 | 2.21 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1022.4669 | -130.6148 | 2.81 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1022.4669 | 142.1127 | 2.87 | 6 |
| Bottom–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1135.8224 | -211.1805 | 1.71 | 6 |
| Botttom–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1261.5791 | 179.8754 | 1.81 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 247.9485 | -2.2109 | 1.65 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 183.1094 | 14.7776 | 1.84 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 788.7783 | -79.5646 | 2.42 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 788.7783 | 88.3314 | 2.48 | 6 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 774.1599 | -36.6649 | 1.72 | 6 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 927.274 | 331.9217 | 3.45 | 6 |
| Bottom–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 161.1712 | -0.4729 | 2.1 | 6 |
| Botttom–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 200.0563 | 12.6969 | 4.88 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 257.6998 | -0.312 | 1.63 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 257.6998 | 2.0657 | 1.71 | 6 |
| Bottom–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1157.8591 | -211.066 | 1.74 | 6 |
| Botttom–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1293.299 | 146.0105 | 1.79 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 956.912 | -98.9952 | 2.95 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 956.912 | 84.9579 | 2.86 | 6 |
| Bottom–Left | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 162.9415 | -1.4471 | 2.31 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 141.0965 | 2.6735 | 2.26 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 821.2955 | -82.0851 | 2.51 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 821.2955 | 85.0954 | 2.53 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1055.41 | -17.4496 | 2.19 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1055.41 | 288.0294 | 3.49 | 6 |
| Bottom–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 211.0241 | -1.1441 | 2.85 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 167.4797 | 1.3376 | 2.34 | 6 |
| Bottom–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 630.6783 | -2.6149 | 1.52 | 6 |
| Botttom–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 630.6783 | 3.7794 | 1.53 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.131 | 202] 1.5 [DL + RSX] | 7300.5063 | 1037.0334 | 9358.6258 |
| Bottom | 0.146 | 202] 1.5 [DL + RSX] | 7947.6402 | 1042.5036 | 10754.7469 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 19.8139 | 19.4974 | 52.9735 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 343.325 | 139.4201 | -85.9294 | 199.0158 | 545.4506 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 871.254 | 533.7395 | -240.7581 | 358.7419 | 965.0027 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 129.3215 | 22.9105 | -19.2866 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 182.5367 | 66.1671 | 221.1739 | 169.5779 | 472.7083 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 26.1884 | 33.859 | 162.7791 | 194.4833 | 555.3529 |
| Top | Leg 7 | 1293.3 | 202] 1.5 [DL + RSX] | -29.0362 | 0.364 | -169.711 | 20.3633 | 169.711 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 134.1465 | 18.9665 | 16.8601 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 908.0594 | 561.3389 | -256.363 | 360.166 | 966.4269 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 322.842 | 24.7053 | -82.6472 | 175.0068 | 478.1373 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 22.7714 | 19.7543 | 54.2585 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 215.5836 | 68.2793 | -220.6258 | 170.8566 | 473.987 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 72.5137 | 66.6184 | 151.898 | 196.2758 | 557.1454 |
| Top | Leg 14 | 1150.62 | 202] 1.5 [DL + RSX] | -12.5031 | 12.6386 | 153.2352 | 20.3633 | 153.2352 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 534.4566 | 57.5613 | -472.7548 | 183.195 | 486.3255 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -81.3093 | 0.1907 | 51.4431 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 365.5883 | 154.257 | -80.6135 | 199.8773 | 546.312 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1089.5331 | 594.9014 | -235.927 | 367.188 | 973.4488 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 122.5201 | 16.6962 | -18.0584 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 245.05 | 96.6092 | 226.5735 | 171.9967 | 475.1272 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -131.0192 | 321.9723 | 162.4914 | 193.47 | 554.3395 |
| Bottom | Leg 7 | 1251.75 | 202] 1.5 [DL + RSX] | 3.3263 | 13.4075 | -164.9138 | 20.3633 | 164.9138 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 134.6659 | 19.8243 | -17.5907 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1118.2061 | 565.6888 | -248.4641 | 368.2974 | 974.5583 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 427.5546 | 3.0063 | -71.9327 | 179.0586 | 482.189 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -69.1689 | -0.7265 | 52.0922 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 259.667 | 93.7359 | -225.3606 | 172.5623 | 475.6928 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -59.6676 | 284.6129 | 149.8124 | 193.47 | 554.3395 |
| Bottom | Leg 14 | 1147.5 | 202] 1.5 [DL + RSX] | 7.6718 | 0.1491 | 152.8752 | 20.3633 | 152.8752 |
| Bottom | Leg 15 | 548.74 | 206] [0.9 DL + 1.5 RSX] | 381.3154 | 110.1759 | -509.9491 | 177.2694 | 509.9491 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 284.4686 | -3.7464 | 4.26 | 6 |
| Top–Right | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 360.5393 | 19.4974 | 8.16 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1051.8516 | -120.3726 | 2.82 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1051.8516 | 139.4201 | 2.92 | 6 |
| Top–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1132.4179 | -138.0101 | 1.58 | 6 |
| Top–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1258.9532 | 211.4651 | 1.86 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 241.4424 | -15.5417 | 2.24 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 341.177 | 5.5963 | 2.39 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 786.4355 | -61.7647 | 2.29 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 786.4355 | 66.1671 | 2.32 | 6 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1311.7748 | -277.0879 | 3.95 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1311.7748 | 33.859 | 2.79 | 6 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 146.1272 | -13.5677 | 4.37 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 146.1272 | 0.364 | 1.89 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 341.6101 | -1.6578 | 2.21 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 341.6101 | 1.0634 | 2.18 | 6 |
| Top–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1182.235 | -137.4602 | 1.64 | 6 |
| Top–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1325.8105 | 251.4872 | 2.01 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 981.9721 | -71.318 | 2.82 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 981.9721 | 103.022 | 3.04 | 6 |
| Top–Left | Leg 11 | 0 | 206] [0.9 DL + 1.5 RSX] | 283.9957 | -3.2846 | 4.17 | 6 |
| Top–Right | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 360.6874 | 19.7543 | 8.21 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 822.5569 | -58.4244 | 2.36 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 822.5569 | 68.2793 | 2.42 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1348.7961 | -249.3032 | 3.89 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1348.7961 | 66.6184 | 3.02 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 169.6443 | -1.4175 | 2.39 | 6 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 169.6443 | 12.6386 | 4.49 | 6 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 571.0699 | -37.6338 | 1.62 | 6 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 626.7602 | 5.2648 | 1.53 | 6 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 195.2732 | -18.7698 | 5.96 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 195.2732 | 0.1907 | 2.48 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1193.9481 | -145.4088 | 3.24 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1193.9481 | 154.257 | 3.29 | 6 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1393.5016 | -412.5718 | 2.36 | 6 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1577.0503 | 155.5992 | 2.14 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 336.1097 | -1.4538 | 2.17 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 253.4557 | 16.6962 | 2.37 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 987.5789 | -91.6467 | 2.97 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 987.5789 | 96.6092 | 3.01 | 6 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1030.8619 | -45.0178 | 2.28 | 6 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1255.8226 | 321.9723 | 4.06 | 6 |
| Bottom–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 196.497 | -1.4864 | 2.73 | 6 |
| Botttom–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 246.4529 | 13.4075 | 5.59 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 345.5549 | -1.0155 | 2.21 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 345.5549 | 1.494 | 2.23 | 6 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1407.5583 | -423.4252 | 2.4 | 6 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1603.6828 | 112.3326 | 2.1 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1096.6382 | -108.8282 | 3.35 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1096.6382 | 92.4203 | 3.24 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 210.3727 | -19.2178 | 6.23 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 182.1319 | 3.2623 | 2.89 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1010.607 | -94.2636 | 3.05 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1010.607 | 93.7359 | 3.04 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1343.5193 | -25.0115 | 2.81 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1343.5193 | 284.6129 | 4.05 | 6 |
| Bottom–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 250.678 | -11.8628 | 5.36 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 250.678 | 0.1491 | 3.16 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 741.0127 | -4.845 | 1.8 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 741.0127 | 3.4932 | 1.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.155 | 202] 1.5 [DL + RSX] | 8809.6346 | 818.5507 | 10930.2299 |
| Bottom | 0.172 | 202] 1.5 [DL + RSX] | 9456.7685 | 869.9595 | 12585.9513 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 29.97 | 19.3705 | 56.8029 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 394.3454 | 152.854 | -107.2911 | 200.99 | 547.4248 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1084.3121 | 589.0003 | -225.3378 | 366.9859 | 973.2468 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 166.0049 | 25.3831 | -21.3416 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 241.7349 | 72.4067 | 244.5276 | 171.8685 | 474.9989 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 68.8721 | 52.8585 | 175.1491 | 196.1349 | 557.0045 |
| Top | Leg 7 | 1282.25 | 202] 1.5 [DL + RSX] | -22.8434 | 1.7105 | -168.4356 | 20.3633 | 168.4356 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 168.7549 | 20.738 | 19.2177 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1116.1557 | 611.3299 | -239.7444 | 368.2181 | 974.479 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 383.9104 | 19.5429 | -83.3197 | 177.3698 | 480.5002 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 28.8728 | 19.6137 | 58.0029 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 256.8927 | 75.5108 | -243.3944 | 172.455 | 475.5854 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 75.9389 | 81.186 | 163.8353 | 196.4084 | 557.2779 |
| Top | Leg 14 | 1163.6 | 202] 1.5 [DL + RSX] | -15.2755 | 13.1686 | 154.7333 | 20.3633 | 154.7333 |
| Top | Leg 15 | 554.44 | 206] [0.9 DL + 1.5 RSX] | 385.99 | 66.2078 | -513.5844 | 177.4503 | 513.5844 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -97.5242 | 1.0039 | 53.4308 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 419.2439 | 172.7734 | -104.4989 | 201.9534 | 548.3882 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1297.7477 | 663.0715 | -226.4906 | 375.2446 | 981.5055 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 157.053 | 19.2075 | -19.825 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 306.718 | 107.4878 | 245.7317 | 174.3829 | 477.5134 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -103.5401 | 310.2229 | 176.9074 | 193.47 | 554.3395 |
| Bottom | Leg 7 | 1216.06 | 202] 1.5 [DL + RSX] | 6.5076 | 14.4106 | -160.7924 | 20.3633 | 160.7924 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 165.799 | 21.9564 | -19.7386 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1317.7161 | 641.4986 | -239.8153 | 376.0173 | 982.2781 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 307.1576 | 105.0082 | -82.4787 | 174.3999 | 477.5304 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -90.717 | 0.1294 | 54.3481 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 304.2921 | 107.2132 | -243.5319 | 174.2891 | 477.4195 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -74.2116 | 278.0851 | 164.7326 | 193.47 | 554.3395 |
| Bottom | Leg 14 | 1128.53 | 202] 1.5 [DL + RSX] | 7.0586 | 1.4978 | 150.6846 | 20.3633 | 150.6846 |
| Bottom | Leg 15 | 553.71 | 206] [0.9 DL + 1.5 RSX] | 450.4595 | 118.7972 | -515.6377 | 179.9449 | 515.6377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 386.4018 | -0.2257 | 4.87 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 386.4018 | 19.3705 | 8.46 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1241.0223 | -131.9021 | 3.27 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1241.0223 | 152.854 | 3.38 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1388.3232 | -342.246 | 2.23 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1573.317 | 175.4801 | 2.17 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 309.7337 | -18.0975 | 2.78 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 418.5889 | 5.3767 | 2.87 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 986.8039 | -72.7654 | 2.84 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 986.8039 | 72.4067 | 2.84 | 6 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1585.2919 | -285.373 | 4.54 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1585.2919 | 52.8585 | 3.42 | 6 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 203.5772 | -13.9235 | 5.16 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 203.5772 | 1.7105 | 2.87 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 418.7762 | -2.3581 | 2.73 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 418.7762 | 0.3323 | 2.63 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1434.3857 | -344.574 | 2.29 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1634.3429 | 216.87 | 2.31 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1134.2663 | -85.3248 | 3.28 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1134.2663 | 107.2554 | 3.43 | 6 |
| Top–Left | Leg 11 | 0 | 206] [0.9 DL + 1.5 RSX] | 300.4293 | -3.5577 | 4.42 | 6 |
| Top–Right | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 382.7549 | 19.6137 | 8.46 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1012.0844 | -70.0109 | 2.89 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1012.0844 | 75.5108 | 2.92 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1595.8182 | -260.7937 | 4.44 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1595.8182 | 81.186 | 3.58 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 217.7688 | -2.5367 | 3.2 | 6 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 217.7688 | 13.1686 | 5.19 | 6 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 675.9784 | -47.8015 | 1.93 | 6 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 734.2864 | 5.0942 | 1.78 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 259.9939 | -18.7243 | 6.76 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 259.9939 | 1.0039 | 3.44 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1379.4741 | -170.2735 | 3.76 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1379.4741 | 172.7734 | 3.77 | 6 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1658.3214 | -513.2867 | 2.85 | 6 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1876.441 | 125.5702 | 2.45 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 422.7643 | -1.1719 | 2.7 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 318.7444 | 19.2075 | 2.89 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1179.3351 | -108.4333 | 3.55 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1179.3351 | 107.4878 | 3.54 | 6 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1278.0352 | -47.1776 | 2.78 | 6 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1571.659 | 310.2229 | 4.63 | 6 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 289.9397 | -0.2055 | 3.66 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 289.9397 | 14.4106 | 6.33 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 430.4952 | -1.2326 | 2.75 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 430.4952 | 1.4663 | 2.76 | 6 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1660.7158 | -530.6027 | 2.88 | 6 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1894.4009 | 98.5168 | 2.42 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1254.6679 | -120.0301 | 3.8 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1254.6679 | 105.0082 | 3.7 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 268.7236 | -19.1016 | 6.94 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 268.7236 | 0.1294 | 3.38 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1190.0362 | -108.6817 | 3.57 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1190.0362 | 107.2132 | 3.56 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1625.6847 | -24.4468 | 3.37 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1625.6847 | 278.0851 | 4.59 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 291.4362 | -13.1853 | 6.12 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 291.4362 | 1.4978 | 3.92 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 853.6561 | -5.7415 | 2.07 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 853.6561 | 2.6179 | 2.05 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.178 | 202] 1.5 [DL + RSX] | 10294.8078 | 697.8691 | 12484.4895 |
| Bottom | 0.197 | 202] 1.5 [DL + RSX] | 10941.9417 | 781.202 | 14367.8622 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 49.04 | 19.9335 | 57.6785 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 445.5187 | 159.5191 | -104.7075 | 202.9701 | 549.4049 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1291.8575 | 660.4408 | -216.7733 | 375.0167 | 981.2776 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 201.6369 | 25.0363 | -22.6627 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 303.7214 | 74.0574 | 246.9189 | 174.267 | 477.3974 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 109.8871 | 74.2497 | 186.1866 | 197.7219 | 558.5915 |
| Top | Leg 7 | 1280.89 | 202] 1.5 [DL + RSX] | -20.5755 | 1.9467 | -168.2782 | 20.3633 | 168.2782 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 201.6285 | 20.6031 | 20.8843 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1316.5082 | 682.3424 | -233.8457 | 375.9705 | 982.2314 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 450.2602 | 16.1732 | -93.2539 | 179.9371 | 483.0676 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 43.4374 | 20.1632 | 58.7422 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 301.6212 | 80.8735 | -242.8111 | 174.1857 | 477.3161 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 86.5309 | 99.1322 | 172.9529 | 196.8182 | 557.6878 |
| Top | Leg 14 | 1186.58 | 202] 1.5 [DL + RSX] | -18.534 | 12.6059 | 157.3878 | 20.3633 | 157.3878 |
| Top | Leg 15 | 548.84 | 206] [0.9 DL + 1.5 RSX] | 455.0618 | 75.8108 | -512.8611 | 180.1229 | 512.8611 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -123.02 | 2.044 | 59.5066 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 472.7077 | 236.5776 | -105.4921 | 204.0221 | 550.4569 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1508.3839 | 739.8823 | -215.1295 | 383.395 | 989.6558 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 192.7281 | 22.8708 | -20.2519 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 380.136 | 119.8068 | 224.6632 | 177.2238 | 480.3542 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -82.0302 | 316.4498 | 183.5219 | 193.47 | 554.3395 |
| Bottom | Leg 7 | 1264.95 | 202] 1.5 [DL + RSX] | -1.3277 | 13.6195 | -166.4372 | 20.3633 | 166.4372 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 198.1 | 25.2303 | -20.8393 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1521.1176 | 727.1794 | -230.3078 | 383.8877 | 990.1485 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 334.0685 | 137.7439 | -88.2292 | 175.4412 | 478.5717 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -120.5533 | 0.981 | 60.7463 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 363.8339 | 125.4114 | -218.7738 | 176.593 | 479.7234 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -84.7597 | 287.1629 | 170.1945 | 193.47 | 554.3395 |
| Bottom | Leg 14 | 1186.73 | 202] 1.5 [DL + RSX] | 0.1455 | 2.9579 | 157.4052 | 20.3633 | 157.4052 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 871.7812 | 118.3916 | -456.2827 | 196.2475 | 499.3779 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 402.7088 | -0.4836 | 5.12 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 402.7088 | 19.9335 | 8.77 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1441.8909 | -144.3471 | 3.76 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1441.8909 | 159.5191 | 3.83 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1653.6824 | -450.6319 | 2.74 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1871.8713 | 145.285 | 2.48 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 372.9978 | -18.8438 | 3.21 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 494.7463 | 4.7704 | 3.32 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1180.2978 | -82.4661 | 3.37 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1180.2978 | 74.0574 | 3.31 | 6 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1844.2422 | -290.7863 | 5.08 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1844.2422 | 74.2497 | 4.04 | 6 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 256.0904 | -13.4112 | 5.72 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 256.0904 | 1.9467 | 3.57 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 494.1035 | -0.2464 | 3.1 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 379.1482 | 20.6031 | 3.34 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1687.1682 | -449.6983 | 2.77 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1920.2511 | 178.1762 | 2.59 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1303.6952 | -95.0011 | 3.75 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1303.6952 | 115.8523 | 3.89 | 6 |
| Top–Left | Leg 11 | 0 | 206] [0.9 DL + 1.5 RSX] | 308.4621 | -3.8265 | 4.57 | 6 |
| Top–Right | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 396.4369 | 20.1632 | 8.74 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1192.5807 | -76.0331 | 3.36 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1192.5807 | 80.8735 | 3.39 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1832.4039 | -269.5463 | 4.96 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1832.4039 | 99.1322 | 4.14 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 265.4929 | -2.8496 | 3.85 | 6 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 265.4929 | 12.6059 | 5.68 | 6 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 778.8153 | -57.4654 | 2.25 | 6 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 848.427 | 3.7978 | 2.05 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 331.7501 | -20.1466 | 7.92 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 331.7501 | 2.044 | 4.53 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1559.6588 | -223.4932 | 4.41 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1559.6588 | 236.5776 | 4.48 | 6 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1924.9807 | -615.9595 | 3.34 | 6 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2162.0242 | 111.1866 | 2.76 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 508.6426 | -0.8219 | 3.22 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 394.2532 | 0.1828 | 2.47 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1361.9329 | -129.9151 | 4.13 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1361.9329 | 119.8068 | 4.06 | 6 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1519.7355 | -52.4565 | 3.29 | 6 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1879.1619 | 316.4498 | 5.28 | 6 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 316.7463 | -2.1244 | 4.36 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 316.7463 | 13.6195 | 6.51 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 514.7521 | -1.4157 | 3.28 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 514.7521 | 1.2346 | 3.28 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2173.2225 | -40.188 | 2.66 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2173.2225 | 131.5504 | 2.81 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1409.9744 | -168.3494 | 4.5 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1409.9744 | 137.7439 | 4.29 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 334.1324 | -20.4847 | 8.02 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 334.1324 | 0.981 | 4.36 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1361.1549 | -124.4154 | 4.09 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1361.1549 | 125.4114 | 4.09 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1906.397 | -33.2436 | 3.97 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1906.397 | 287.1629 | 5.19 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 318.6996 | -12.9315 | 6.41 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 318.6996 | 2.9579 | 4.54 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 972.6624 | -5.9618 | 2.36 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 972.6624 | 2.1929 | 2.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.205 | 202] 1.5 [DL + RSX] | 11839.8014 | 644.7901 | -14438.9255 |
| Bottom | 0.217 | 202] 1.5 [DL + RSX] | 12486.9353 | 614.3993 | -15443.7882 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 61.1417 | 21.5652 | 54.9677 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 517.5535 | 201.3179 | 67.1931 | 205.7574 | 552.1922 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1503.0318 | 742.167 | -196.0132 | 383.1879 | 989.4487 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 236.9844 | 28.4286 | -23.0556 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 376.5328 | 86.9715 | 194.9312 | 177.0843 | 480.2148 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 152.6904 | 79.5514 | 138.9197 | 199.3782 | 560.2477 |
| Top | Leg 7 | 1366.83 | 202] 1.5 [DL + RSX] | -8.1589 | 0.8502 | -178.202 | 20.3633 | 178.202 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 234.321 | 24.3904 | 22.8555 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1520.7755 | 766.7145 | -209.9343 | 383.8744 | 990.1353 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 521.2652 | 26.1262 | -82.0017 | 182.6846 | 485.815 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 53.0205 | 21.6807 | 55.8372 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 360.8591 | 100.6687 | -183.4284 | 176.4779 | 479.6083 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 103.6995 | 94.7203 | 128.1352 | 197.4825 | 558.3521 |
| Top | Leg 14 | 1290.32 | 202] 1.5 [DL + RSX] | -6.8276 | 9.6494 | 169.3672 | 20.3633 | 169.3672 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 879.9408 | 84.1724 | -448.26 | 196.5632 | 499.6936 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -81.5469 | 1.8033 | 53.4807 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 548.1829 | 213.701 | 62.4732 | 206.9426 | 553.3773 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1735.8846 | 810.7961 | -194.8396 | 392.1979 | 998.4587 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 240.2095 | 23.5541 | 22.1307 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 442.5933 | 122.6823 | 179.343 | 179.6405 | 482.7709 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3.4786 | 290.6219 | 138.4081 | 193.6046 | 554.4741 |
| Bottom | Leg 7 | 1308.39 | 202] 1.5 [DL + RSX] | 24.3857 | 11.4468 | -171.4542 | 20.3633 | 171.4542 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 241.6799 | 25.6382 | -22.0091 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1736.3625 | 802.6215 | -204.4771 | 392.2164 | 998.4772 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 567.7533 | -10.2787 | -74.9091 | 184.4834 | 487.6139 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -81.1958 | 0.9008 | 54.802 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 418.7952 | 113.3037 | -165.8784 | 178.7196 | 481.8501 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -10.1535 | 268.4645 | 128.0428 | 193.47 | 554.3395 |
| Bottom | Leg 14 | 1244.08 | 202] 1.5 [DL + RSX] | 19.7899 | 1.2106 | 164.027 | 20.3633 | 164.027 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 986.825 | 119.9914 | -403.4591 | 200.699 | 503.8294 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 437.5302 | -1.056 | 5.67 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 437.5302 | 21.5652 | 9.51 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1635.2105 | -209.0255 | 4.5 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1635.2105 | 201.3179 | 4.46 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1921.5169 | -558.3788 | 3.24 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2157.8582 | 144.5625 | 2.81 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 430.4983 | -24.3618 | 3.83 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 569.003 | 2.7028 | 3.68 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1362.2789 | -107.1815 | 3.97 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1362.2789 | 86.9715 | 3.84 | 6 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2119.4887 | -264.3442 | 5.51 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2119.4887 | 79.5514 | 4.62 | 6 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 295.9195 | -10.4761 | 5.66 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 295.9195 | 0.8502 | 3.86 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 567.6018 | -1.1003 | 3.6 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 435.0454 | 24.3904 | 3.86 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1944.4666 | -554.8841 | 3.26 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2192.979 | 167.9376 | 2.9 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1474.7822 | -127.5223 | 4.38 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1474.7822 | 158.7101 | 4.59 | 6 |
| Top–Left | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 428.9786 | -0.3188 | 5.42 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 428.9786 | 21.6807 | 9.43 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1363.1471 | -93.6977 | 3.88 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1363.1471 | 100.6687 | 3.93 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2088.1996 | -250.4154 | 5.38 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2088.1996 | 94.7203 | 4.63 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 303.619 | -1.7751 | 4.13 | 6 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 303.619 | 9.6494 | 5.6 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 969.3863 | -0.6186 | 2.31 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 969.3863 | 2.4688 | 2.32 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 325.321 | -21.8172 | 8.16 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 325.321 | 1.8033 | 4.4 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1748.4626 | -179.8023 | 4.58 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1748.4626 | 213.701 | 4.76 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 2459.2351 | -2.237 | 2.93 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 2459.2351 | 103.5545 | 3.1 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 592.16 | -0.2865 | 3.71 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 455.7632 | 0.2362 | 2.86 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1529.4801 | -115.6134 | 4.43 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1529.4801 | 122.6823 | 4.48 | 6 |
| Bottom–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2084.4242 | -0.0018 | 4.17 | 6 |
| Botttom–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2084.4242 | 290.6219 | 5.56 | 6 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 357.357 | -0.1155 | 4.49 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 357.357 | 11.4468 | 6.61 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 595.3161 | -0.274 | 3.73 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 595.3161 | 1.5183 | 3.79 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2465.2821 | -8.2544 | 2.95 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2465.2821 | 82.5273 | 3.08 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1569.2402 | -153.586 | 4.78 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1569.2402 | 109.9324 | 4.48 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 326.9508 | -21.9776 | 8.21 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 326.9508 | 0.9008 | 4.26 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1523.3604 | -125.0848 | 4.48 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1523.3604 | 113.3037 | 4.4 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2099.5006 | -36.1605 | 4.37 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2099.5006 | 268.4645 | 5.49 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 354.5594 | -10.4709 | 6.4 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 354.5594 | 1.2106 | 4.66 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1094.3884 | -6.1719 | 2.65 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1094.3884 | 2.1054 | 2.62 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.227 | 202] 1.5 [DL + RSX] | 13398.465 | 524.694 | -15732.7272 |
| Bottom | 0.236 | 202] 1.5 [DL + RSX] | 14045.599 | 536.8382 | -16253.2195 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 57.9132 | 22.3615 | 60.7891 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 704.3123 | 20.9112 | -61.5467 | 212.9838 | 559.4186 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1730.6141 | 817.4655 | -177.1324 | 391.9939 | 998.2548 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 284.1288 | 24.9753 | -22.0626 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 439.9372 | 103.9474 | 186.8628 | 179.5377 | 482.6681 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 206.0221 | 59.705 | 147.3781 | 201.4418 | 562.3114 |
| Top | Leg 7 | 1335.83 | 202] 1.5 [DL + RSX] | 17.5823 | 1.0177 | -174.6221 | 20.3633 | 174.6221 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 278.3254 | 20.4569 | 21.9318 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1737.0591 | 846.1252 | -191.4116 | 392.2433 | 998.5042 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 592.1579 | 21.896 | -82.613 | 185.4277 | 488.5582 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 50.9629 | 22.4175 | 61.74 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 416.9983 | 103.0938 | -172.5698 | 178.6501 | 481.7805 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 150.4302 | 81.3388 | 135.3338 | 199.2907 | 560.1603 |
| Top | Leg 14 | 1269.27 | 202] 1.5 [DL + RSX] | 13.0788 | 10.8219 | 166.9361 | 20.3633 | 166.9361 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 994.9017 | 93.9743 | -403.0888 | 201.0115 | 504.1419 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -51.4967 | 1.7835 | 54.4629 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 766.9563 | 33.2753 | 62.2909 | 215.4078 | 561.8426 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1954.163 | 865.4439 | -179.5373 | 400.6439 | 1006.9048 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 284.8617 | 22.9199 | 20.7477 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 527.2782 | 122.6885 | 181.8973 | 182.9173 | 486.0477 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 115.0096 | 301.1006 | 150.3812 | 197.9202 | 558.7897 |
| Bottom | Leg 7 | 1296.8 | 202] 1.5 [DL + RSX] | 39.344 | 11.651 | -170.1159 | 20.3633 | 170.1159 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 283.0147 | 25.2989 | -20.5024 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1946.1435 | 861.2489 | -189.6441 | 400.3336 | 1006.5945 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 642.2116 | -9.6311 | -75.8962 | 187.3645 | 490.4949 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -53.3079 | 0.9385 | 55.8086 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 498.8719 | 119.8151 | 173.0276 | 181.8181 | 484.9486 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 90.5041 | 281.6531 | 137.6454 | 196.9719 | 557.8415 |
| Bottom | Leg 14 | 1245.03 | 202] 1.5 [DL + RSX] | 32.725 | 1.7398 | 164.1376 | 20.3633 | 164.1376 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 1101.269 | 121.299 | 421.0129 | 205.1273 | 508.2577 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 482.1121 | -1.2179 | 6.25 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 482.1121 | 22.3615 | 10.22 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1823.3925 | -193.1575 | 4.8 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1823.3925 | 190.5702 | 4.79 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2192.9828 | -656.9102 | 3.73 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2456.3599 | 127.5417 | 3.14 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 490.5852 | -20.2113 | 4.01 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 649.4102 | 3.6283 | 4.23 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1529.4316 | -108.4267 | 4.38 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1529.4316 | 103.9474 | 4.35 | 6 |
| Top–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2335.9353 | -281.1847 | 6.02 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2335.9353 | 59.705 | 4.96 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 346.7786 | -11.6511 | 6.52 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 346.7786 | 1.0177 | 4.53 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 645.4471 | -1.6012 | 4.11 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 492.4516 | 20.4569 | 4.04 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2202.5118 | -652.1419 | 3.73 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2485.9638 | 161.6225 | 3.23 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1636.478 | -116.1839 | 4.69 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1636.478 | 145.9392 | 4.89 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 473.0953 | -0.4616 | 6 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 473.0953 | 22.4175 | 10.12 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1525.128 | -109.7512 | 4.38 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1525.128 | 103.0938 | 4.33 | 6 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2297.9216 | -263.8273 | 5.86 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2297.9216 | 81.3388 | 4.99 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 348.6207 | -1.9985 | 4.73 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 348.6207 | 10.8219 | 6.39 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1091.9272 | -1.7612 | 2.61 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1091.9272 | 1.2514 | 2.61 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 352.478 | -22.0339 | 8.54 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 352.478 | 1.7835 | 4.74 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1910.8997 | -182.5486 | 4.93 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1910.8997 | 214.7735 | 5.1 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 2731.4289 | -16.2215 | 3.28 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 2731.4289 | 96.1887 | 3.42 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 665.4743 | -0.286 | 4.17 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 509.0608 | 0.2348 | 3.19 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1682.8218 | -122.0013 | 4.84 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1682.8218 | 122.6885 | 4.84 | 6 |
| Bottom–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2295.7062 | -19.1815 | 4.68 | 6 |
| Botttom–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2295.7062 | 301.1006 | 6.04 | 6 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 388.5237 | -0.6466 | 4.98 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 388.5237 | 11.651 | 7.04 | 6 |
| Bottom–Left | Leg 8 | 0 | 207] [0.9 DL + 1.5 RSY] | 509.2854 | -0.1477 | 3.19 | 6 |
| Botttom–Right | Leg 8 | 0 | 207] [0.9 DL + 1.5 RSY] | 666.2292 | 1.6884 | 4.24 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2732.7742 | -11.4249 | 3.27 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2732.7742 | 73.3186 | 3.38 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1707.8433 | -155.3795 | 5.12 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1707.8433 | 113.4068 | 4.84 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 353.1062 | -22.1109 | 8.56 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 353.1062 | 0.9385 | 4.59 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1672.5882 | -124.7067 | 4.83 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1672.5882 | 119.8151 | 4.8 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2299.7252 | -50.6854 | 4.84 | 6 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2299.7252 | 281.6531 | 5.95 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 384.1973 | -10.6888 | 6.81 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 384.1973 | 1.7398 | 5.13 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1216.3551 | -6.5025 | 2.94 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1216.3551 | 1.9193 | 2.91 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.247 | 202] 1.5 [DL + RSX] | 14939.3371 | 471.7026 | -16727.0196 |
| Bottom | 0.253 | 202] 1.5 [DL + RSX] | 15586.4711 | 468.6894 | -16816.0369 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 63.2121 | 22.2576 | 63.024 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 709.1232 | 200.6804 | -66.9882 | 213.17 | 559.6048 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1947.7562 | 874.5403 | -163.6208 | 400.396 | 1006.6569 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 328.7877 | 26.6056 | -23.0402 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 526.9931 | 111.6943 | 205.472 | 182.9063 | 486.0367 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 290.6851 | 65.9289 | 157.1338 | 204.7177 | 565.5873 |
| Top | Leg 7 | 1339.8 | 202] 1.5 [DL + RSX] | 36.9747 | 2.189 | -175.0808 | 20.3633 | 175.0808 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 320.1162 | 22.3801 | 22.8987 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1947.4077 | 910.8784 | -180.0291 | 400.3825 | 1006.6434 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 661.6589 | 21.5009 | -86.7649 | 188.117 | 491.2474 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 55.9655 | 22.2197 | 64.0094 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 499.2293 | 115.544 | -192.102 | 181.832 | 484.9624 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 229.3482 | 86.8162 | 146.5609 | 202.3444 | 563.2139 |
| Top | Leg 14 | 1281.53 | 202] 1.5 [DL + RSX] | 30.0621 | 11.1781 | 168.3522 | 20.3633 | 168.3522 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 1109.1392 | 106.5339 | 424.9237 | 205.4318 | 508.5622 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -30.5954 | 2.5005 | 56.2826 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 747.7357 | 218.9776 | 67.7241 | 214.6641 | 561.0988 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2172.1141 | 901.3652 | -168.303 | 409.0773 | 1015.3382 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 329.6305 | 23.8079 | 22.0334 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 624.5498 | 123.7821 | 201.7288 | 186.6811 | 489.8115 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 236.5311 | 305.4375 | 158.5199 | 202.6223 | 563.4919 |
| Bottom | Leg 7 | 1291.14 | 202] 1.5 [DL + RSX] | 56.3465 | 11.9702 | -169.4616 | 20.3633 | 169.4616 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 325.174 | 25.7248 | -21.7584 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2159.3407 | 900.5202 | -180.5548 | 408.5831 | 1014.844 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 732.623 | -8.2034 | -77.436 | 190.8629 | 493.9933 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -33.9992 | 1.7097 | 57.6203 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 592.8041 | 123.882 | 194.0425 | 185.4527 | 488.5832 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 202.0629 | 289.6314 | 147.177 | 201.2886 | 562.1582 |
| Bottom | Leg 14 | 1248.93 | 202] 1.5 [DL + RSX] | 48.4233 | 2.1448 | 164.5875 | 20.3633 | 164.5875 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 1215.5957 | 121.4708 | 467.3142 | 209.551 | 512.6815 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 524.193 | -2.0227 | 6.93 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 524.193 | 22.2576 | 10.73 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1983.3868 | -201.5772 | 5.18 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1983.3868 | 200.6804 | 5.18 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2449.1215 | -737.871 | 4.17 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2726.7632 | 115.5861 | 3.44 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 544.9266 | -22.1463 | 4.44 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 721.8149 | 3.4109 | 4.67 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1682.192 | -120.732 | 4.83 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1682.192 | 111.6943 | 4.77 | 6 |
| Top–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2553.4547 | -273.8144 | 6.42 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2553.4547 | 65.9289 | 5.42 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 376.1371 | -11.8643 | 6.93 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 376.1371 | 2.189 | 5.11 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 715.7291 | -1.5008 | 4.54 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 545.1573 | 22.3801 | 4.46 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2450.7674 | -729.5095 | 4.16 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2750.4461 | 160.4715 | 3.55 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1774.2563 | -122.7349 | 5.06 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1774.2563 | 150.4006 | 5.25 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 514.1335 | -1.3265 | 6.68 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 514.1335 | 22.2197 | 10.59 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1673.5785 | -117.3247 | 4.78 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1673.5785 | 115.544 | 4.77 | 6 |
| Top–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2510.1016 | -257.9788 | 6.26 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2510.1016 | 86.8162 | 5.44 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 375.6625 | -3.0204 | 5.26 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 375.6625 | 11.1781 | 6.79 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1212.6856 | -2.4055 | 2.9 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1212.6856 | 0.5341 | 2.89 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 381.3757 | -21.9464 | 8.88 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 381.3757 | 2.5005 | 5.24 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2065.0906 | -189.3412 | 5.29 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2065.0906 | 218.9776 | 5.44 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 2983.2631 | -21.0481 | 3.59 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 2983.2631 | 84.7332 | 3.7 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 730.2476 | -0.2288 | 4.57 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 554.4042 | 0.2092 | 3.47 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1825.4179 | -126.4419 | 5.21 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1825.4179 | 123.7821 | 5.19 | 6 |
| Bottom–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2484.0754 | -33.963 | 5.13 | 6 |
| Botttom–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2484.0754 | 305.4375 | 6.43 | 6 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 419.2136 | -1.1588 | 5.46 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 419.2136 | 11.9702 | 7.48 | 6 |
| Bottom–Left | Leg 8 | 0 | 207] [0.9 DL + 1.5 RSY] | 553.4413 | -0.2269 | 3.47 | 6 |
| Botttom–Right | Leg 8 | 0 | 207] [0.9 DL + 1.5 RSY] | 729.0038 | 1.3822 | 4.62 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2981.3293 | -17.4944 | 3.58 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 2981.3293 | 72.2546 | 3.67 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1840.1915 | -158.3666 | 5.46 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1840.1915 | 118.892 | 5.19 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 380.2104 | -21.9434 | 8.87 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 380.2104 | 1.7097 | 5.07 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1811.942 | -126.1431 | 5.17 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1811.942 | 123.882 | 5.16 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2478.8314 | -61.086 | 5.25 | 6 |
| Botttom–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2478.8314 | 289.6314 | 6.35 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 413.8041 | -11.111 | 7.26 | 6 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 413.8041 | 2.1448 | 5.57 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1335.7326 | -6.7816 | 3.23 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1335.7326 | 1.8123 | 3.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.265 | 202] 1.5 [DL + RSX] | 16463.1912 | 423.5917 | -17422.7344 |
| Bottom | 0.269 | 202] 1.5 [DL + RSX] | 17110.3252 | 413.871 | -17160.7076 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 72.0489 | 22.48 | 65.0816 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 820.5249 | 209.2188 | 75.183 | 217.4806 | 563.9153 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2165.6925 | 913.3066 | -158.7257 | 408.8289 | 1015.0897 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 373.9096 | 27.984 | -24.1613 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 625.6166 | 117.8191 | 230.1759 | 186.7224 | 489.8528 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 389.7368 | 77.1565 | 167.2645 | 208.5505 | 569.42 |
| Top | Leg 7 | 1352.74 | 202] 1.5 [DL + RSX] | 59.3528 | 3.0689 | -176.5755 | 20.3633 | 176.5755 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 363.0201 | 23.6789 | 24.0927 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2161.8041 | 956.7289 | -178.419 | 408.6784 | 1014.9393 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 744.2962 | 21.9003 | -92.3146 | 191.3146 | 494.445 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 64.0759 | 22.3874 | 66.0126 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 594.3719 | 124.9678 | -217.9262 | 185.5134 | 488.6438 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 323.2474 | 97.3567 | 157.1834 | 205.9777 | 566.8473 |
| Top | Leg 14 | 1303.25 | 202] 1.5 [DL + RSX] | 50.4263 | 11.4522 | 170.8603 | 20.3633 | 170.8603 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 1223.4713 | 117.4845 | 472.1981 | 209.8558 | 512.9862 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -9.803 | 3.2884 | 57.3989 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 861.478 | 221.5536 | 75.6914 | 219.0652 | 565.5 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2394.5625 | 917.135 | -166.3021 | 417.6848 | 1023.9456 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 374.5509 | 24.9673 | 23.4063 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 728.354 | 124.984 | 222.9727 | 190.6977 | 493.8281 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 366.5522 | 307.4008 | 169.3689 | 207.6533 | 568.5229 |
| Bottom | Leg 7 | 1293.13 | 202] 1.5 [DL + RSX] | 75.1074 | 12.2125 | -169.6922 | 20.3633 | 169.6922 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 368.4224 | 26.4741 | -23.0179 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2378.2602 | 917.4369 | -181.3729 | 417.054 | 1023.3148 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 835.6624 | -7.7694 | -80.9388 | 194.8499 | 497.9803 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -14.2575 | 2.5073 | 58.7097 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 693.6169 | 124.9912 | 215.1307 | 189.3536 | 492.484 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 323.4389 | 293.8461 | 158.4729 | 205.9851 | 566.8547 |
| Bottom | Leg 14 | 1258.81 | 202] 1.5 [DL + RSX] | 66.3241 | 2.6648 | 165.7288 | 20.3633 | 165.7288 |
| Bottom | Leg 15 | 533.34 | 206] [0.9 DL + 1.5 RSX] | 795.6674 | 123.0675 | 516.6483 | 193.3023 | 516.6483 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 556.5746 | -2.7257 | 7.47 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 556.5746 | 22.48 | 11.17 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2136.3954 | -210.5205 | 5.55 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2136.3954 | 209.2188 | 5.54 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2697.7307 | -795.2747 | 4.56 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2978.1803 | 104.2482 | 3.72 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 596.2455 | -23.6482 | 4.84 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 786.0093 | 3.4573 | 5.07 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1823.6649 | -130.296 | 5.23 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1823.6649 | 117.8191 | 5.14 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2743.4709 | -274.7608 | 6.81 | 6 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2743.4709 | 77.1565 | 5.86 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 404.8742 | -12.0939 | 7.33 | 6 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 404.8742 | 3.0689 | 5.64 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 778.1215 | -1.5957 | 4.94 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 595.1998 | 23.6789 | 4.83 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2694.6327 | -783.5916 | 4.54 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2996.8347 | 155.434 | 3.83 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1906.5356 | -128.5964 | 5.41 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1906.5356 | 155.754 | 5.6 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 545.4855 | -2.045 | 7.2 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 545.4855 | 22.3874 | 11.02 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1811.7293 | -123.6521 | 5.15 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1811.7293 | 124.9678 | 5.16 | 6 |
| Top–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2695.4884 | -259.0465 | 6.63 | 6 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2695.4884 | 97.3567 | 5.86 | 6 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 402.5463 | -3.8375 | 5.75 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 402.5463 | 11.4522 | 7.18 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1330.3661 | -2.7847 | 3.19 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1330.3661 | 0.254 | 3.17 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 409.9869 | -22.1268 | 9.27 | 6 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 409.9869 | 3.2884 | 5.74 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2209.3533 | -191.603 | 5.6 | 6 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2209.3533 | 221.5536 | 5.76 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3227.528 | -25.6451 | 3.89 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3227.528 | 78.5954 | 3.98 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 786.1139 | -1.7175 | 4.99 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 786.1139 | 0.0045 | 4.91 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1956.8746 | -128.0395 | 5.53 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1956.8746 | 124.984 | 5.51 | 6 |
| Bottom–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2652.4657 | -48.4717 | 5.54 | 6 |
| Botttom–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2652.4657 | 307.4008 | 6.78 | 6 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 446.9144 | -1.7646 | 5.92 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 446.9144 | 12.2125 | 7.88 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 783.4098 | -0.0804 | 4.9 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 783.4098 | 1.1974 | 4.95 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3223.4319 | -25.4502 | 3.88 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3223.4319 | 75.4421 | 3.97 | 6 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1963.3305 | -159.9903 | 5.76 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1963.3305 | 120.7048 | 5.5 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 407.1994 | -22.0748 | 9.23 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 407.1994 | 2.5073 | 5.56 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1940.5056 | -127.8636 | 5.49 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1940.5056 | 124.9912 | 5.47 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2639.3784 | -72.8048 | 5.63 | 6 |
| Botttom–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2639.3784 | 293.8461 | 6.69 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 440.7268 | -11.4286 | 7.65 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 440.7268 | 2.6648 | 6.01 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1452.7787 | -7.0835 | 3.51 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1452.7787 | 1.6946 | 3.47 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.282 | 202] 1.5 [DL + RSX] | 17967.9296 | 385.073 | -17845.7289 |
| Bottom | 0.285 | 202] 1.5 [DL + RSX] | 18615.0635 | 176.707 | -17361.0455 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 84.6999 | 22.6759 | 66.8545 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 937.8908 | 214.6643 | 80.1375 | 222.0219 | 568.4567 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2388.0386 | 931.8374 | -165.1031 | 417.4323 | 1023.6932 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 419.2612 | 29.4168 | -25.382 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 730.498 | 122.4145 | 250.9259 | 190.7807 | 493.9111 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 501.8205 | 89.1519 | 176.2874 | 212.8874 | 573.757 |
| Top | Leg 7 | 1364.64 | 202] 1.5 [DL + RSX] | 82.4123 | 3.8615 | -177.9499 | 20.3633 | 177.9499 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 406.9972 | 25.0304 | 25.3244 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2381.3939 | 979.7328 | -187.6101 | 417.1752 | 1023.4361 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 839.1632 | 21.0195 | -98.5702 | 194.9854 | 498.1158 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 76.1653 | 22.5366 | 67.717 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 696.1138 | 129.6952 | -239.6119 | 189.4502 | 492.5806 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 431.1861 | 107.5888 | 166.7522 | 210.1543 | 571.0239 |
| Top | Leg 14 | 1322.89 | 202] 1.5 [DL + RSX] | 71.9836 | 11.7124 | 173.1289 | 20.3633 | 173.1289 |
| Top | Leg 15 | 540.67 | 206] [0.9 DL + 1.5 RSX] | 800.2335 | 126.5852 | 521.2647 | 193.479 | 521.2647 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 10.6982 | 4.1915 | 58.3428 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 982.02 | 223.3142 | 81.4753 | 223.7295 | 570.1642 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2617.518 | 914.2519 | -174.2544 | 426.3118 | 1032.5727 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 419.6385 | 26.2019 | 24.7649 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 837.0021 | 125.5194 | 239.9712 | 194.9017 | 498.0322 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 501.9591 | 309.5468 | 179.015 | 212.8928 | 573.7623 |
| Bottom | Leg 7 | 1297.27 | 202] 1.5 [DL + RSX] | 94.9684 | 12.4354 | -170.1696 | 20.3633 | 170.1696 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 412.3983 | 27.4183 | -24.3173 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2598.3202 | 914.5043 | -191.5805 | 425.569 | 1031.8298 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 949.2404 | -6.8303 | -85.761 | 199.2447 | 502.3751 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 5.4465 | 3.4111 | 59.6244 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 799.5643 | 125.5921 | 234.6674 | 193.4531 | 496.5836 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 451.5159 | 297.6577 | 168.6977 | 210.9409 | 571.8105 |
| Bottom | Leg 14 | 1269.69 | 202] 1.5 [DL + RSX] | 85.6459 | 3.2626 | 166.9851 | 20.3633 | 166.9851 |
| Bottom | Leg 15 | 603.56 | 206] [0.9 DL + 1.5 RSX] | 863.983 | 124.1055 | 561.8603 | 195.9457 | 561.8603 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 583.6189 | -3.5477 | 7.96 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 583.6189 | 22.6759 | 11.55 | 6 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2280.8637 | -213.213 | 5.86 | 6 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2280.8637 | 214.6643 | 5.87 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2941.7225 | -826.964 | 4.91 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 3222.3229 | 98.8604 | 4 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 644.4998 | -25.0747 | 5.2 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 841.0834 | 3.5803 | 5.42 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1954.3963 | -135.3379 | 5.57 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1954.3963 | 122.4145 | 5.49 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2908.8289 | -277.5829 | 7.15 | 6 |
| Top–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2908.8289 | 89.1519 | 6.25 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 431.901 | -12.3104 | 7.71 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 431.901 | 3.8615 | 6.12 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 831.8746 | -1.5441 | 5.27 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 642.5848 | 25.0304 | 5.19 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2935.3813 | -812.7696 | 4.88 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3237.3037 | 153.3159 | 4.11 | 6 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 2030.3021 | -132.6906 | 5.74 | 6 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 2030.3021 | 156.8116 | 5.9 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 571.7125 | -2.8765 | 7.69 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 571.7125 | 22.5366 | 11.37 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1939.4564 | -128.6201 | 5.49 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1939.4564 | 129.6952 | 5.5 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2856.9472 | -262.6745 | 6.97 | 6 |
| Top–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2856.9472 | 107.5888 | 6.23 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 428.256 | -4.5622 | 6.21 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 428.256 | 11.7124 | 7.55 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1445.4085 | -3.1601 | 3.46 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1445.4085 | 0.127 | 3.44 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 439.0581 | -22.3018 | 9.67 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 439.0581 | 4.1915 | 6.27 | 6 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 2345.5051 | -193.5293 | 5.89 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2345.5051 | 223.3142 | 6.05 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3462.8449 | -29.0874 | 4.17 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3462.8449 | 74.8125 | 4.25 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 834.4379 | -1.6527 | 5.29 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 834.4379 | 0.2516 | 5.23 | 6 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 2079.0146 | -129.1279 | 5.83 | 6 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 2079.0146 | 125.5194 | 5.8 | 6 |
| Bottom–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2809.0718 | -62.8577 | 5.92 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2809.0718 | 309.5468 | 7.1 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 471.5809 | -2.4482 | 6.35 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 471.5809 | 12.4354 | 8.23 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 830.6275 | -0.2507 | 5.2 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 830.6275 | 1.1149 | 5.24 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3456.9005 | -31.3837 | 4.17 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3456.9005 | 77.7566 | 4.25 | 6 |
| Bottom–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 2079.545 | -160.7525 | 6.04 | 6 |
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 2079.545 | 122.3294 | 5.78 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 434.8053 | -22.2069 | 9.6 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 434.8053 | 3.4111 | 6.07 | 6 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 2060.0443 | -128.9332 | 5.78 | 6 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 2060.0443 | 125.5921 | 5.76 | 6 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2789.389 | -84.9552 | 5.99 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2789.389 | 297.6577 | 7.01 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 464.8578 | -11.722 | 8.01 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 464.8578 | 3.2626 | 6.42 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1566.2336 | -7.3973 | 3.78 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1566.2336 | 1.5688 | 3.74 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.298 | 202] 1.5 [DL + RSX] | 19451.462 | 140.3109 | -18064.956 |
| Bottom | 0.3 | 202] 1.5 [DL + RSX] | 20098.5959 | 140.8706 | -17469.6809 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 99.843 | 22.8653 | 68.4007 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1060.3219 | 218.3213 | 82.7974 | 226.7593 | 573.1941 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2610.6731 | 931.1952 | -178.4751 | 426.0469 | 1032.3078 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 464.6656 | 30.785 | -26.6003 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 839.8897 | 125.23 | 266.8826 | 195.0135 | 498.1439 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 624.1405 | 101.6069 | 183.5152 | 217.6205 | 578.49 |
| Top | Leg 7 | 1375.71 | 202] 1.5 [DL + RSX] | 105.1968 | 4.6293 | -179.2285 | 20.3633 | 179.2285 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 451.4892 | 26.397 | 26.5367 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2601.2892 | 981.2987 | -202.7826 | 425.6838 | 1031.9447 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 946.2046 | 20.3052 | -105.6679 | 199.1272 | 502.2577 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 90.8681 | 22.6819 | 69.1966 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 802.6982 | 132.2624 | -256.501 | 193.5744 | 496.7048 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 550.3281 | 118.0256 | 174.6154 | 214.7644 | 575.6339 |
| Top | Leg 14 | 1340.69 | 202] 1.5 [DL + RSX] | 93.6076 | 11.944 | 175.1835 | 20.3633 | 175.1835 |
| Top | Leg 15 | 609.86 | 206] [0.9 DL + 1.5 RSX] | 868.4744 | 132.5997 | 565.8519 | 196.1195 | 565.8519 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 30.4172 | 5.1596 | 59.1442 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1107.1343 | 225.1794 | 85.0597 | 228.5706 | 575.0054 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2838.4664 | 898.4471 | -187.3601 | 434.8612 | 1041.122 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 464.5236 | 27.4701 | 26.1108 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 949.0038 | 125.5304 | 253.2438 | 199.2355 | 502.366 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 639.5453 | 311.7837 | 186.7319 | 218.2165 | 579.0861 |
| Bottom | Leg 7 | 1300.63 | 202] 1.5 [DL + RSX] | 115.8456 | 12.662 | -170.5575 | 20.3633 | 170.5575 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 456.4272 | 28.3915 | -25.6161 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2817.0624 | 899.0167 | -206.2263 | 434.033 | 1040.2938 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1068.2084 | -5.7003 | -92.0459 | 203.848 | 506.9785 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 24.5585 | 4.3746 | 60.3907 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 909.1999 | 126.0216 | 251.2755 | 197.6954 | 500.8258 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 582.8279 | 301.2748 | 177.0714 | 216.0219 | 576.8915 |
| Bottom | Leg 14 | 1278.89 | 202] 1.5 [DL + RSX] | 106.1695 | 3.8851 | 168.0468 | 20.3633 | 168.0468 |
| Bottom | Leg 15 | 665.75 | 206] [0.9 DL + 1.5 RSX] | 931.2302 | 125.4569 | 602.1642 | 198.5478 | 602.1642 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 607.2738 | -4.4498 | 8.43 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 607.2738 | 22.8653 | 11.88 | 6 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2418.4417 | -214.2925 | 6.15 | 6 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2418.4417 | 218.3213 | 6.18 | 6 |
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 3178.99 | -836.0986 | 5.21 | 6 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 3457.4293 | 94.6859 | 4.28 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 690.606 | -26.4983 | 5.56 | 6 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 888.0716 | 3.6762 | 5.72 | 6 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 2076.229 | -138.2319 | 5.88 | 6 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 2076.229 | 125.23 | 5.8 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3057.1027 | -279.3862 | 7.46 | 6 |
| Top–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 3057.1027 | 101.6069 | 6.6 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 457.688 | -12.5005 | 8.06 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 457.688 | 4.6293 | 6.59 | 6 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 877.8923 | -1.4209 | 5.55 | 6 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 688.1512 | 26.397 | 5.54 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3170.5875 | -819.6598 | 5.17 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3469.7603 | 151.2763 | 4.39 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2147.6089 | -135.5509 | 6.04 | 6 |
| Top–Right | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 2147.6089 | 157.0214 | 6.18 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 594.6689 | -3.7833 | 8.14 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 594.6689 | 22.6819 | 11.69 | 6 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 2058.5884 | -131.7944 | 5.8 | 6 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 2058.5884 | 132.2624 | 5.8 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3002.0142 | -265.4702 | 7.28 | 6 |
| Top–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 3002.0142 | 118.0256 | 6.57 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 453.0825 | -5.2628 | 6.65 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 453.0825 | 11.944 | 7.9 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1556.7625 | -3.5775 | 3.73 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1556.7625 | 0.079 | 3.71 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 469.123 | -22.4476 | 10.07 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 469.123 | 5.1596 | 6.83 | 6 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2475.065 | -195.6913 | 6.18 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2475.065 | 225.1794 | 6.33 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3688.8681 | -30.478 | 4.44 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3688.8681 | 71.7253 | 4.51 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 877.3205 | -1.6543 | 5.56 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 877.3205 | 0.5528 | 5.51 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2193.709 | -130 | 6.11 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2193.709 | 125.5304 | 6.08 | 6 |
| Bottom–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2958.2583 | -76.9788 | 6.29 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2958.2583 | 311.7837 | 7.41 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 493.8675 | -3.1539 | 6.76 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 493.8675 | 12.662 | 8.55 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 872.6701 | -0.4828 | 5.48 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 872.6701 | 1.0732 | 5.5 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3681.3112 | -35.0654 | 4.44 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3681.3112 | 79.5926 | 4.52 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2190.316 | -161.4985 | 6.31 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2190.316 | 124.2175 | 6.06 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 463.505 | -22.3144 | 9.98 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 463.505 | 4.3746 | 6.61 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2172.4975 | -129.4548 | 6.05 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2172.4975 | 126.0216 | 6.03 | 6 |
| Bottom–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2933.0602 | -97.1824 | 6.33 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2933.0602 | 301.2748 | 7.31 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 486.7436 | -12.0134 | 8.34 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 486.7436 | 3.8851 | 6.81 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1676.3354 | -7.6987 | 4.04 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1676.3354 | 1.4522 | 4 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.312 | 202] 1.5 [DL + RSX] | 20911.6137 | 118.9661 | -18128.1051 |
| Bottom | 0.316 | 202] 1.5 [DL + RSX] | 21558.7476 | 112.9324 | -17513.9865 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 116.714 | 23.0146 | 69.7251 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1259.7816 | 32.7111 | 84.9975 | 234.4772 | 580.9119 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2831.1936 | 916.8742 | -192.9308 | 434.5798 | 1040.8406 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 509.6918 | 32.0701 | -27.7677 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 952.2475 | 126.9071 | 280.3996 | 199.361 | 502.4915 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 754.052 | 114.3745 | 189.8882 | 222.6473 | 583.5168 |
| Top | Leg 7 | 1384.84 | 202] 1.5 [DL + RSX] | 127.4905 | 5.3922 | -180.2822 | 20.3633 | 180.2822 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 495.7771 | 27.7029 | 27.6915 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2818.9649 | 967.7885 | -218.4171 | 434.1066 | 1040.3674 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1062.3856 | 19.6565 | -112.8803 | 203.6227 | 506.7532 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 107.3918 | 22.788 | 70.4581 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 912.6118 | 133.8717 | -270.9632 | 197.8274 | 500.9578 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 677.7913 | 128.6885 | 181.6201 | 219.6964 | 580.566 |
| Top | Leg 14 | 1355.59 | 202] 1.5 [DL + RSX] | 114.9542 | 12.1396 | 176.9048 | 20.3633 | 176.9048 |
| Top | Leg 15 | 671.52 | 206] [0.9 DL + 1.5 RSX] | 935.6254 | 136.5284 | 605.8325 | 198.7179 | 605.8325 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 49.3477 | 6.1654 | 59.8225 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1235.2881 | 226.2689 | 87.1668 | 233.5294 | 579.9642 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3055.334 | 878.3772 | -200.268 | 443.2526 | 1049.5135 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 508.9373 | 28.7049 | 27.399 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1062.9754 | 125.0037 | 265.1984 | 203.6455 | 506.776 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 777.6322 | 313.8401 | 193.4472 | 223.5597 | 584.4292 |
| Bottom | Leg 7 | 1301.73 | 202] 1.5 [DL + RSX] | 137.7956 | 12.8757 | -170.6849 | 20.3633 | 170.6849 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 500.0696 | 29.3169 | -26.8614 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3032.4788 | 880.7616 | -220.2817 | 442.3683 | 1048.6292 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1185.7299 | -4.5072 | -98.9398 | 208.3954 | 511.5258 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 43.0384 | 5.3735 | 61.0296 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1021.0466 | 126.1363 | 266.716 | 202.0232 | 505.1536 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 715.4055 | 304.4961 | 184.422 | 221.1519 | 582.0214 |
| Bottom | Leg 14 | 1285.03 | 202] 1.5 [DL + RSX] | 127.8853 | 4.52 | 168.7559 | 20.3633 | 168.7559 |
| Bottom | Leg 15 | 726.53 | 206] [0.9 DL + 1.5 RSX] | 997.2673 | 127.4378 | 641.5727 | 201.103 | 641.5727 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 628.2263 | -5.4171 | 8.87 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 628.2263 | 23.0146 | 12.17 | 6 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2550.1857 | -215.0881 | 6.43 | 6 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2550.1857 | 221.7936 | 6.47 | 6 |
| Top–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3683.3391 | -2.6647 | 4.39 | 6 |
| Top–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3683.3391 | 90.7584 | 4.54 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 734.9309 | -27.8519 | 5.9 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 734.9309 | 32.0701 | 6.1 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2191.0305 | -140.1351 | 6.17 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2191.0305 | 126.9071 | 6.08 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3191.8006 | -279.9585 | 7.73 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3191.8006 | 114.3745 | 6.93 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 482.8979 | -12.6582 | 8.41 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 482.8979 | 5.3922 | 7.05 | 6 |
| Top–Left | Leg 8 | 200 | 202] 1.5 [DL + RSX] | 732.2279 | -32.3109 | 6.09 | 6 |
| Top–Right | Leg 8 | 0 | 202] 1.5 [DL + RSX] | 732.2279 | 27.7029 | 5.87 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3400.6925 | -809.84 | 5.43 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3694.0138 | 148.9719 | 4.65 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2259.6756 | -138.206 | 6.32 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2259.6756 | 157.106 | 6.45 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 615.0247 | -4.7527 | 8.58 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 615.0247 | 22.788 | 11.96 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2171.0518 | -133.7823 | 6.08 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2171.0518 | 133.8717 | 6.08 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3134.1093 | -266.9943 | 7.55 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3134.1093 | 128.6885 | 6.89 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 477.5993 | -5.9611 | 7.09 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 477.5993 | 12.1396 | 8.25 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1665.0358 | -4.018 | 3.99 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1665.0358 | 0.104 | 3.97 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 500.0371 | -22.5336 | 10.48 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 500.0371 | 6.1654 | 7.41 | 6 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2598.7029 | -197.13 | 6.44 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2598.7029 | 226.2689 | 6.59 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3906.7701 | -29.5047 | 4.7 | 6 |
| Botttom–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3906.7701 | 68.6313 | 4.77 | 6 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 917.7687 | -1.6547 | 5.81 | 6 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 917.7687 | 0.8615 | 5.78 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2302.2087 | -130.5143 | 6.37 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2302.2087 | 125.0037 | 6.33 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3101.8537 | -90.9252 | 6.64 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3101.8537 | 313.8401 | 7.71 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 513.8482 | -3.8676 | 7.15 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 513.8482 | 12.8757 | 8.84 | 6 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 912.5499 | -0.7422 | 5.74 | 6 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 912.5499 | 1.04 | 5.75 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3897.9302 | -37.0082 | 4.7 | 6 |
| Botttom–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 3897.9302 | 81.5706 | 4.78 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2296.0909 | -161.7238 | 6.57 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2296.0909 | 125.7628 | 6.32 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 493.1286 | -22.3649 | 10.36 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 493.1286 | 5.3735 | 7.17 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2279.1512 | -129.4145 | 6.31 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2279.1512 | 126.1363 | 6.28 | 6 |
| Bottom–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 3072.1541 | -109.5313 | 6.67 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3072.1541 | 304.4961 | 7.61 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 506.4393 | -12.2853 | 8.63 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 506.4393 | 4.52 | 7.18 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1784.2735 | -7.9776 | 4.3 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1784.2735 | 1.3519 | 4.26 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.327 | 202] 1.5 [DL + RSX] | 22346.0918 | 104.4217 | -18054.569 |
| Bottom | 0.333 | 203] 1.5 [DL + RSY] | 24411.1105 | -6980.2329 | -214.7883 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 135.3453 | 23.0962 | 70.8308 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1400.6869 | 35.1448 | 90.6091 | 239.9294 | 586.3641 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3047.5505 | 897.3967 | -204.2101 | 442.9515 | 1049.2123 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 553.9935 | 33.2272 | -28.8337 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1066.1462 | 127.7652 | 294.466 | 203.7682 | 506.8987 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 890.6463 | 127.2763 | 196.578 | 227.9326 | 588.8022 |
| Top | Leg 7 | 1390.69 | 202] 1.5 [DL + RSX] | 149.2385 | 6.1481 | -180.9576 | 20.3633 | 180.9576 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 539.3548 | 28.895 | 28.7444 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3032.364 | 948.2423 | -230.6785 | 442.3638 | 1048.6247 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1182.9884 | 18.9853 | -119.3729 | 208.2893 | 511.4198 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 125.7523 | 22.8264 | 71.5067 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1024.3294 | 134.8329 | -285.9565 | 202.1502 | 505.2806 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 812.4096 | 139.3877 | 188.921 | 224.9054 | 585.7749 |
| Top | Leg 14 | 1366.37 | 202] 1.5 [DL + RSX] | 135.9021 | 12.2902 | 178.1492 | 20.3633 | 178.1492 |
| Top | Leg 15 | 732.59 | 206] [0.9 DL + 1.5 RSX] | 1001.5384 | 138.9184 | 645.4086 | 201.2683 | 645.4086 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 67.4987 | 7.179 | 60.3572 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1529.0653 | 36.9638 | 93.579 | 244.8968 | 591.3316 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3265.8547 | 863.7089 | -209.2512 | 451.3985 | 1057.6594 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 552.5864 | 29.856 | 28.587 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1177.3038 | 123.9899 | 278.8219 | 208.0694 | 511.1998 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 914.5067 | 315.799 | 200.3314 | 228.8559 | 589.7255 |
| Bottom | Leg 7 | 1299.14 | 202] 1.5 [DL + RSX] | 160.7684 | 13.0642 | -170.386 | 20.3633 | 170.386 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 542.9338 | 30.1531 | -28.0043 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3242.3167 | 869.9344 | -230.3735 | 450.4877 | 1056.7486 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1294.9386 | -3.1786 | -105.516 | 212.6211 | 515.7516 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 60.8638 | 6.3798 | 61.524 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1133.3539 | 126.104 | 283.6499 | 206.3688 | 509.4992 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 847.2684 | 307.4487 | 191.9095 | 226.2542 | 587.1237 |
| Bottom | Leg 14 | 1286.75 | 202] 1.5 [DL + RSX] | 150.678 | 5.1608 | 168.9549 | 20.3633 | 168.9549 |
| Bottom | Leg 15 | 792.71 | 206] [0.9 DL + 1.5 RSX] | 1061.908 | 130.8917 | 684.1908 | 203.6042 | 684.1908 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 646.2123 | -6.4228 | 9.28 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 646.2123 | 23.0962 | 12.41 | 6 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2676.5472 | -215.0785 | 6.7 | 6 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2676.5472 | 224.6946 | 6.75 | 6 |
| Top–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3901.3179 | -3.3576 | 4.65 | 6 |
| Top–Right | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 3901.3179 | 86.7849 | 4.79 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 777.7502 | -29.091 | 6.22 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 965.7034 | 3.7369 | 6.21 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2300.0968 | -141.3638 | 6.44 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2300.0968 | 127.7652 | 6.35 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3313.7425 | -279.3349 | 7.97 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3313.7425 | 127.2763 | 7.24 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 507.7213 | -12.7749 | 8.74 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 507.7213 | 6.1481 | 7.5 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 954.6727 | -1.2089 | 6.02 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 775.1 | 28.895 | 6.2 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3626.9204 | -792.2469 | 5.67 | 6 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3911.4269 | 145.9961 | 4.9 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2366.8386 | -140.3603 | 6.59 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2366.8386 | 156.6069 | 6.7 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 632.522 | -5.76 | 8.99 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 632.522 | 22.8264 | 12.19 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2278.1723 | -134.9088 | 6.34 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2278.1723 | 134.8329 | 6.34 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3254.0521 | -267.2446 | 7.79 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3254.0521 | 139.3877 | 7.18 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 501.9885 | -6.6554 | 7.52 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 501.9885 | 12.2902 | 8.58 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1771.8276 | -4.451 | 4.25 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1771.8276 | 0.1789 | 4.22 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 531.8417 | -22.5314 | 10.87 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 531.8417 | 7.179 | 7.99 | 6 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2716.9474 | -197.0591 | 6.69 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2716.9474 | 225.5585 | 6.84 | 6 |
| Bottom–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 4118.4231 | -26.661 | 4.95 | 6 |
| Botttom–Right | Leg 3 | 500 | 202] 1.5 [DL + RSX] | 3859.2409 | 863.7089 | 6.06 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 959.1757 | -1.6119 | 6.07 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 959.1757 | 1.1319 | 6.05 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2405.7513 | -130.8366 | 6.62 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2405.7513 | 123.9899 | 6.57 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3241.5856 | -104.6885 | 6.99 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3241.5856 | 315.799 | 8 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 531.4741 | -4.5819 | 7.5 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 531.4741 | 13.0642 | 9.09 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 953.6696 | -0.9942 | 6.01 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 953.6696 | 0.9957 | 6.01 | 6 |
| Bottom–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 4108.7183 | -38.0308 | 4.96 | 6 |
| Botttom–Right | Leg 9 | 500 | 202] 1.5 [DL + RSX] | 3819.6223 | 869.9344 | 6.03 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2397.2119 | -160.6727 | 6.8 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2397.2119 | 126.3849 | 6.57 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 523.7116 | -22.3288 | 10.73 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 523.7116 | 6.3798 | 7.74 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2381.3164 | -128.8591 | 6.55 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2381.3164 | 126.104 | 6.53 | 6 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3208.4142 | -121.9138 | 7 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3208.4142 | 307.4487 | 7.89 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 523.9021 | -12.5246 | 8.9 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 523.9021 | 5.1608 | 7.52 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1891.2094 | -8.2335 | 4.56 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1891.2094 | 1.2601 | 4.51 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.344 | 203] 1.5 [DL + RSY] | 25230.0603 | -7215.4428 | -206.8482 |
| Bottom | 0.352 | 203] 1.5 [DL + RSY] | 25877.1942 | -7120.23 | -241.7717 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 156.2665 | 23.0728 | 71.736 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1540.5741 | 37.4282 | 94.9376 | 245.3421 | 591.7769 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3257.54 | 882.61 | -209.8223 | 451.0768 | 1057.3377 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 597.1977 | 34.1784 | -29.7439 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1179.8789 | 127.4785 | 311.5416 | 208.169 | 511.2994 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1033.2321 | 140.2697 | 204.2232 | 233.4499 | 594.3194 |
| Top | Leg 7 | 1391.9 | 202] 1.5 [DL + RSX] | 170.0654 | 6.8827 | -181.098 | 20.3633 | 181.098 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 581.769 | 29.91 | 29.6499 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3239.3797 | 932.7064 | -237.4864 | 450.3741 | 1056.635 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1302.6033 | 18.2762 | -124.6337 | 212.9177 | 516.0481 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 146.4667 | 22.7589 | 72.3626 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1136.0082 | 135.0697 | -303.928 | 206.4715 | 509.6019 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 953.2296 | 150.1026 | 197.1735 | 230.3542 | 591.2238 |
| Top | Leg 14 | 1371.77 | 202] 1.5 [DL + RSX] | 156.0233 | 12.3774 | 178.773 | 20.3633 | 178.773 |
| Top | Leg 15 | 799.48 | 206] [0.9 DL + 1.5 RSX] | 1066.0235 | 139.9412 | 688.4597 | 203.7635 | 688.4597 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 84.0755 | 8.1589 | 60.7025 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1641.0615 | 38.0347 | 99.0094 | 249.2304 | 595.6652 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3468.7248 | 862.5191 | -212.1942 | 459.2484 | 1065.5093 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 595.1022 | 30.8935 | 29.6115 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1289.0799 | 123.3983 | 296.6182 | 212.3944 | 515.5249 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1045.2354 | 317.6026 | 208.0809 | 233.9143 | 594.7839 |
| Bottom | Leg 7 | 1291.53 | 202] 1.5 [DL + RSX] | 184.1226 | 13.2243 | -169.507 | 20.3633 | 169.507 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 584.6184 | 30.9039 | -28.9725 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3445.1932 | 874.1771 | -234.752 | 458.3379 | 1064.5987 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1391.1897 | -1.6624 | -111.2722 | 216.3455 | 519.4759 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 77.2116 | 7.3524 | 61.8314 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1243.0643 | 126.5498 | 302.6775 | 210.6139 | 513.7443 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 973.2828 | 310.135 | 200.2545 | 231.1302 | 591.9997 |
| Bottom | Leg 14 | 1282.81 | 202] 1.5 [DL + RSX] | 173.8274 | 5.8205 | 168.4997 | 20.3633 | 168.4997 |
| Bottom | Leg 15 | 864.49 | 206] [0.9 DL + 1.5 RSX] | 1125.1614 | 136.7668 | 730.1583 | 206.0518 | 730.1583 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 660.6596 | -7.4317 | 9.65 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 660.6596 | 23.0728 | 12.58 | 6 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2798.3165 | -213.1658 | 6.94 | 6 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2798.3165 | 225.7414 | 7.01 | 6 |
| Top–Left | Leg 3 | 0 | 202] 1.5 [DL + RSX] | 4113.3 | -2.1703 | 4.9 | 6 |
| Top–Right | Leg 3 | 500 | 202] 1.5 [DL + RSX] | 3858.6858 | 882.61 | 6.09 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 819.5299 | -30.1641 | 6.54 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1002.2066 | 3.6687 | 6.44 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2404.7664 | -141.8469 | 6.69 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2404.7664 | 127.4785 | 6.59 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3423.4079 | -277.2443 | 8.18 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3423.4079 | 140.2697 | 7.52 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 532.4243 | -12.8341 | 9.06 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 532.4243 | 6.8827 | 7.95 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 991.4477 | -1.1651 | 6.25 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 817.2694 | 29.91 | 6.51 | 6 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 3850.378 | -777.5682 | 5.91 | 6 |
| Top–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3850.378 | 932.7064 | 6.17 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2469.5054 | -141.1834 | 6.84 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2469.5054 | 154.8151 | 6.93 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 646.6047 | -6.7713 | 9.35 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 646.6047 | 22.7589 | 12.35 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2381.3581 | -134.8473 | 6.59 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2381.3581 | 135.0697 | 6.59 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3362.4226 | -265.9357 | 8 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3362.4226 | 150.1026 | 7.45 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 526.5154 | -7.3328 | 7.96 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 526.5154 | 12.3774 | 8.9 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1878.6771 | -4.85 | 4.51 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1878.6771 | 0.2667 | 4.47 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 565.3878 | -22.411 | 11.27 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 565.3878 | 8.1589 | 8.6 | 6 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2831.6166 | -196.0717 | 6.92 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2831.6166 | 223.6169 | 7.06 | 6 |
| Bottom–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4079.5231 | -823.1988 | 6.26 | 6 |
| Botttom–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4079.5231 | 862.5191 | 6.32 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1004.4512 | -1.5121 | 6.35 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1004.4512 | 1.3276 | 6.34 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2506.2194 | -131.5743 | 6.86 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2506.2194 | 123.3983 | 6.81 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3381.2963 | -117.9197 | 7.33 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3381.2963 | 317.6026 | 8.29 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 546.9822 | -5.309 | 7.83 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 546.9822 | 13.2243 | 9.32 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 998.8987 | -1.2008 | 6.3 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 998.8987 | 0.9494 | 6.29 | 6 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4038.1542 | -827.0683 | 6.21 | 6 |
| Botttom–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4038.1542 | 874.1771 | 6.29 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2495.4748 | -158.6005 | 7.02 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2495.4748 | 126.2574 | 6.8 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 556.0864 | -22.1744 | 11.11 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 556.0864 | 7.3524 | 8.33 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2480.9795 | -128.6968 | 6.78 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2480.9795 | 126.5498 | 6.77 | 6 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3345.7693 | -133.9041 | 7.33 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3345.7693 | 310.135 | 8.18 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 539.3823 | -12.7265 | 9.13 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 539.3823 | 5.8205 | 7.83 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1997.9823 | -8.4635 | 4.81 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1997.9823 | 1.152 | 4.76 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.362 | 203] 1.5 [DL + RSY] | 26679.6666 | -7099.4467 | -229.5924 |
| Bottom | 0.371 | 203] 1.5 [DL + RSY] | 27326.8005 | -7413.5854 | -263.1781 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 179.9244 | 22.8787 | 72.48 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1569.0904 | 224.2877 | 103.2004 | 246.4456 | 592.8803 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3460.0837 | 881.2113 | -208.6473 | 458.914 | 1065.1749 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 638.9546 | 34.7431 | -30.3745 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1290.3652 | 125.5621 | 332.4854 | 212.4442 | 515.5746 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1178.0437 | 153.3788 | 212.08 | 239.0532 | 599.9228 |
| Top | Leg 7 | 1386.21 | 202] 1.5 [DL + RSX] | 188.8541 | 7.5318 | -180.4403 | 20.3633 | 180.4403 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 622.6796 | 30.663 | 30.2852 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3439.1171 | 929.6525 | -238.188 | 458.1027 | 1064.3636 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1416.4448 | 17.3176 | -128.763 | 217.3227 | 520.4531 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 169.9369 | 22.5197 | 73.0599 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1244.421 | 134.3341 | -325.7769 | 210.6664 | 513.7968 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1096.2388 | 160.9226 | 205.61 | 235.8878 | 596.7574 |
| Top | Leg 14 | 1369.56 | 202] 1.5 [DL + RSX] | 174.1566 | 12.3888 | 178.5172 | 20.3633 | 178.5172 |
| Top | Leg 15 | 871.45 | 206] [0.9 DL + 1.5 RSX] | 1129.1308 | 139.372 | 734.5312 | 206.2054 | 734.5312 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 96.4277 | 9.0961 | 60.8648 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1618.5746 | 224.6419 | 104.6636 | 248.3603 | 594.7951 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3665.7395 | 878.2435 | -207.9701 | 466.8717 | 1073.1325 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 636.3673 | 31.8219 | 30.3572 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1393.6907 | 126.2288 | 318.9552 | 216.4422 | 519.5727 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1158.5026 | 317.1641 | 216.1568 | 238.2971 | 599.1666 |
| Bottom | Leg 7 | 1278.83 | 202] 1.5 [DL + RSX] | 206.8154 | 13.3201 | -168.0402 | 20.3633 | 168.0402 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 625.0495 | 31.5789 | -29.6449 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3642.8275 | 895.6751 | -232.4745 | 465.9851 | 1072.246 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1474.2379 | -0.5874 | -116.4104 | 219.5589 | 522.6894 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 89.4726 | 8.2773 | 61.9494 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1345.3007 | 127.7156 | 320.5871 | 214.5698 | 517.7003 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1081.9935 | 310.4232 | 208.8975 | 235.3366 | 596.2062 |
| Bottom | Leg 14 | 1273.14 | 202] 1.5 [DL + RSX] | 196.295 | 6.5683 | 167.3829 | 20.3633 | 167.3829 |
| Bottom | Leg 15 | 930.35 | 206] [0.9 DL + 1.5 RSX] | 1187.7049 | 144.8677 | 772.5038 | 208.4718 | 772.5038 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 671.0834 | -8.4233 | 9.97 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 671.0834 | 22.8787 | 12.68 | 6 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2917.9825 | -208.7568 | 7.17 | 6 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2917.9825 | 224.2877 | 7.25 | 6 |
| Top–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4079.6848 | -802.7449 | 6.22 | 6 |
| Top–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4079.6848 | 881.2113 | 6.36 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 860.9434 | -30.9884 | 6.83 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1041.3297 | 3.4809 | 6.67 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2507.0267 | -141.3446 | 6.93 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2507.0267 | 125.5621 | 6.82 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3523.1185 | -273.4986 | 8.36 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3523.1185 | 153.3788 | 7.78 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 557.6099 | -12.8232 | 9.37 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 557.6099 | 7.5318 | 8.38 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1031.3232 | -1.1241 | 6.5 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 859.4437 | 30.663 | 6.81 | 6 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4072.4571 | -775.4225 | 6.17 | 6 |
| Top–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4072.4571 | 929.6525 | 6.43 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2569.6575 | -140.4172 | 7.07 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2569.6575 | 151.4226 | 7.15 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 656.8127 | -7.7674 | 9.67 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 656.8127 | 22.5197 | 12.43 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2482.6862 | -133.107 | 6.82 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2482.6862 | 134.3341 | 6.82 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3461.7573 | -262.8508 | 8.19 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3461.7573 | 160.9226 | 7.7 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 551.7728 | -7.9293 | 8.38 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 551.7728 | 12.3888 | 9.22 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1986.5522 | -5.2017 | 4.77 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1986.5522 | 0.3338 | 4.73 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 602.0826 | -22.1288 | 11.68 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 602.0826 | 9.0961 | 9.23 | 6 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2947.3668 | -196.9556 | 7.17 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2947.3668 | 224.6419 | 7.31 | 6 |
| Bottom–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4301.5672 | -837.7267 | 6.55 | 6 |
| Botttom–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4301.5672 | 878.2435 | 6.61 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1055.3089 | -1.3524 | 6.66 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1055.3089 | 1.4367 | 6.66 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2606.1802 | -132.9697 | 7.11 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2606.1802 | 126.2288 | 7.06 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3526.1956 | -130.6088 | 7.68 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3526.1956 | 317.1641 | 8.57 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 561.3399 | -6.114 | 8.16 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 561.3399 | 13.3201 | 9.51 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1049.8751 | -1.357 | 6.63 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1049.8751 | 0.8992 | 6.6 | 6 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4258.0653 | -848.3721 | 6.51 | 6 |
| Botttom–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4258.0653 | 895.6751 | 6.59 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2595.646 | -158.2663 | 7.26 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2595.646 | 126.817 | 7.04 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 591.6069 | -21.8587 | 11.49 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 591.6069 | 8.2773 | 8.95 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2580.6265 | -132.0089 | 7.04 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2580.6265 | 127.7156 | 7.01 | 6 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3489.6545 | -145.7931 | 7.68 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3489.6545 | 310.4232 | 8.47 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 553.9386 | -12.855 | 9.33 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 553.9386 | 6.5683 | 8.16 | 6 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 2105.41 | -8.64 | 5.07 | 6 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 2105.41 | 1.0012 | 5.02 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.372 | 203] 1.5 [DL + RSY] | 28112.4232 | -7088.81 | -250.0252 |
| Bottom | 0.383 | 203] 1.5 [DL + RSY] | 28759.5571 | -7836.8627 | -277.5842 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 205.5121 | 22.4042 | 73.1019 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1687.5986 | 222.203 | 116.3747 | 262.0482 | 608.483 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3657.2038 | 897.5853 | -199.9372 | 487.0166 | 1093.2775 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 679.2876 | 34.5965 | -30.5211 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1392.9153 | 123.3173 | 353.7687 | 225.91 | 529.0404 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1314.1745 | 166.1772 | 217.7333 | 255.0432 | 615.9128 |
| Top | Leg 7 | 1368.78 | 202] 1.5 [DL + RSX] | 204.3596 | 7.9443 | -178.4273 | 20.3633 | 178.4273 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 662.2076 | 30.9372 | 30.4739 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3633.9223 | 943.0523 | -232.1656 | 486.0762 | 1092.3371 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1522.3737 | 15.345 | -132.4968 | 231.1391 | 534.2695 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 195.2433 | 21.9933 | 73.6601 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1344.6071 | 131.6129 | -348.2308 | 223.9587 | 527.0891 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1230.3088 | 171.1725 | 211.704 | 251.6557 | 612.5253 |
| Top | Leg 14 | 1354.86 | 202] 1.5 [DL + RSX] | 189.0837 | 12.3566 | 176.8207 | 20.3633 | 176.8207 |
| Top | Leg 15 | 920.53 | 206] [0.9 DL + 1.5 RSX] | 1191.6203 | 137.0513 | 775.8615 | 217.7792 | 775.8615 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 99.3622 | 9.9673 | 61.2648 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1730.8211 | 236.3415 | 120.5192 | 263.794 | 610.2288 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3858.928 | 905.9233 | -194.8403 | 495.1647 | 1101.4256 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 676.0556 | 32.8791 | 30.6964 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1488.7802 | 135.7053 | 338.012 | 229.7822 | 532.9126 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1241.2348 | 310.5258 | 222.3785 | 252.097 | 612.9666 |
| Bottom | Leg 7 | 1258.69 | 202] 1.5 [DL + RSX] | 227.7813 | 13.3755 | -165.7147 | 20.3633 | 165.7147 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 663.844 | 32.3242 | -29.8541 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3837.5968 | 928.8601 | -221.3013 | 494.3031 | 1100.5639 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1547.9295 | -0.5843 | -122.0688 | 232.1713 | 535.3018 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 92.4579 | 9.1312 | 62.3429 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1437.51 | 129.3779 | 334.3682 | 227.7113 | 530.8417 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1159.5667 | 303.7612 | 215.6812 | 248.7983 | 609.6678 |
| Bottom | Leg 14 | 1255.84 | 202] 1.5 [DL + RSX] | 217.5238 | 7.4466 | 165.3853 | 20.3633 | 165.3853 |
| Bottom | Leg 15 | 950.97 | 206] [0.9 DL + 1.5 RSX] | 1250.3846 | 152.4385 | 796.6903 | 220.1529 | 796.6903 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 676.8234 | -9.3101 | 10.21 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 676.8234 | 22.4042 | 12.66 | 6 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 3040.8463 | -202.3608 | 7.39 | 6 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 3040.8463 | 222.203 | 7.49 | 6 |
| Top–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4302.6288 | -820.2521 | 6.52 | 6 |
| Top–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4302.6288 | 897.5853 | 6.65 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 902.8708 | -31.3695 | 7.11 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1085.3277 | 3.1031 | 6.93 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2609.4682 | -138.8981 | 7.16 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2609.4682 | 123.3173 | 7.05 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3617.1098 | -269.8112 | 8.53 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3617.1098 | 166.1772 | 8.03 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 584.3201 | -12.7702 | 9.7 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 584.3201 | 7.9443 | 8.79 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1076.4379 | -1.0479 | 6.78 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 902.5381 | 30.9372 | 7.09 | 6 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4296.1722 | -790.6975 | 6.46 | 6 |
| Top–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4296.1722 | 943.0523 | 6.72 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2672.2762 | -139.768 | 7.31 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2672.2762 | 146.8901 | 7.36 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 662.6279 | -8.659 | 9.91 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 662.6279 | 21.9933 | 12.41 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2584.6238 | -131.0285 | 7.05 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2584.6238 | 131.6129 | 7.05 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3556.6739 | -259.8227 | 8.36 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3556.6739 | 171.1725 | 7.93 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 578.9021 | -8.2849 | 8.79 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 578.9021 | 12.3566 | 9.55 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 2095.9276 | -5.4998 | 5.03 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 2095.9276 | 0.3756 | 4.99 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 644.7673 | -21.5234 | 12.1 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 644.7673 | 9.9673 | 9.93 | 6 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 3069.9273 | -205.8456 | 7.47 | 6 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 3069.9273 | 236.3415 | 7.63 | 6 |
| Bottom–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4528.5551 | -863.6291 | 6.86 | 6 |
| Botttom–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4528.5551 | 905.9233 | 6.93 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1110.81 | -1.1027 | 6.99 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1110.81 | 1.604 | 7.02 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2709.7582 | -134.9755 | 7.37 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2709.7582 | 135.7053 | 7.37 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3680.6157 | -143.8732 | 8.05 | 6 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3680.6157 | 310.5258 | 8.85 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 576.1035 | -7.0625 | 8.53 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 576.1035 | 13.3755 | 9.71 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1105.5044 | -1.4477 | 6.98 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1105.5044 | 0.805 | 6.95 | 6 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4482.67 | -881.0487 | 6.83 | 6 |
| Botttom–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4482.67 | 928.8601 | 6.92 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2703.5584 | -164.7182 | 7.56 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2703.5584 | 132.1081 | 7.34 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 633.2432 | -21.2042 | 11.89 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 633.2432 | 9.1312 | 9.63 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2683.9075 | -142.347 | 7.36 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2683.9075 | 129.3779 | 7.27 | 6 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3644.3239 | -160.1115 | 8.06 | 6 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3644.3239 | 303.7612 | 8.75 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 569.684 | -12.924 | 9.54 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 569.684 | 7.4466 | 8.52 | 6 |
| Bottom–Left | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 2100.634 | -158.6897 | 6.08 | 6 |
| Botttom–Right | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 2100.634 | 150.8757 | 6.03 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.39 | 203] 1.5 [DL + RSY] | 29526.7871 | -7184.5609 | -267.105 |
| Bottom | 0.402 | 203] 1.5 [DL + RSY] | 30173.921 | -8268.0416 | -287.3628 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 232.5564 | 21.9574 | 72.1806 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1793.2618 | 223.7768 | 126.9125 | 266.3161 | 612.7509 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3850.1979 | 927.5899 | -181.41 | 494.8121 | 1101.0729 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 717.8124 | 33.2284 | -29.705 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1485.7143 | 124.8197 | 359.7736 | 229.6583 | 532.7888 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1427.1937 | 176.8996 | 218.6395 | 259.6083 | 620.4779 |
| Top | Leg 7 | 1338.04 | 202] 1.5 [DL + RSX] | 216.9801 | 7.9179 | -174.8778 | 20.3633 | 174.8778 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 699.8481 | 29.9524 | 29.648 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3825.7322 | 969.6378 | -215.4253 | 493.8238 | 1100.0847 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1621.1525 | 11.5657 | -139.0066 | 235.129 | 538.2594 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 221.87 | 21.4853 | 72.7695 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1434.6462 | 125.2356 | -355.6172 | 227.5956 | 530.726 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1340.1345 | 177.57 | 215.2933 | 256.0918 | 616.9614 |
| Top | Leg 14 | 1326.66 | 202] 1.5 [DL + RSX] | 201.4666 | 12.0234 | 173.5637 | 20.3633 | 173.5637 |
| Top | Leg 15 | 951.83 | 206] [0.9 DL + 1.5 RSX] | 1254.2705 | 133.67 | 797.3641 | 220.3098 | 797.3641 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 92.6708 | 11.6432 | 62.3007 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1827.8658 | 260.6657 | 129.2673 | 267.7139 | 614.1487 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4037.8409 | 929.9221 | -169.8035 | 502.3914 | 1108.6522 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 711.8605 | 33.8358 | 30.3445 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1579.3246 | 144.2786 | -337.6063 | 233.4395 | 536.5699 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1308.5529 | 302.311 | 220.2091 | 254.8161 | 615.6857 |
| Bottom | Leg 7 | 1218.11 | 202] 1.5 [DL + RSX] | 243.1949 | 13.4838 | -161.0286 | 20.3633 | 161.0286 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 698.0143 | 32.0864 | -29.4128 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4019.2861 | 959.3988 | -197.0191 | 501.6419 | 1107.9028 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1622.0473 | -6.6211 | -117.4771 | 235.1651 | 538.2956 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 84.2283 | 10.7711 | 63.6991 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1527.3532 | 138.9928 | 347.6725 | 231.3402 | 534.4707 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1217.7556 | 302.127 | 216.2392 | 251.1486 | 612.0182 |
| Bottom | Leg 14 | 1247.3 | 202] 1.5 [DL + RSX] | 233.1052 | 8.2577 | 164.399 | 20.3633 | 164.399 |
| Bottom | Leg 15 | 934.98 | 206] [0.9 DL + 1.5 RSX] | 1310.9774 | 157.397 | 789.4392 | 222.6003 | 789.4392 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 676.7505 | -10.0732 | 10.35 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 676.7505 | 21.9574 | 12.58 | 6 |
| Top–Left | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 3051.2647 | -15.8096 | 6.44 | 6 |
| Top–Right | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 3051.2647 | 42.8025 | 6.58 | 6 |
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4530.1612 | -850.904 | 6.84 | 6 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4530.1612 | 927.5899 | 6.97 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1133.7113 | -0.0987 | 7.09 | 6 |
| Top–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1133.7113 | 2.8591 | 7.22 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2716.253 | -133.0289 | 7.37 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2716.253 | 124.8197 | 7.32 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3711.0542 | -269.1007 | 8.71 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3711.0542 | 176.8996 | 8.27 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 613.4496 | -12.4165 | 10 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 613.4496 | 7.9179 | 9.15 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1125.952 | -1.0581 | 7.09 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 946.7896 | 29.9524 | 7.32 | 6 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4524.2203 | -818.9707 | 6.78 | 6 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4524.2203 | 969.6378 | 7.04 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2783.0605 | -142.4076 | 7.6 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2783.0605 | 143.5578 | 7.6 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 663.1176 | -9.4625 | 10.06 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 663.1176 | 21.4853 | 12.32 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2690.8827 | -132.8528 | 7.31 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2690.8827 | 125.2356 | 7.26 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3652.7989 | -260.626 | 8.56 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3652.7989 | 177.57 | 8.16 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 609.6444 | -8.3009 | 9.18 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 609.6444 | 12.0234 | 9.87 | 6 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 2206.1183 | -5.6691 | 5.29 | 6 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 2206.1183 | 0.4278 | 5.26 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 697.6077 | -21.7127 | 12.79 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 697.6077 | 11.6432 | 10.9 | 6 |
| Bottom–Left | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 3115.7538 | -9.1365 | 6.54 | 6 |
| Botttom–Right | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 3195.7985 | 260.6657 | 8.02 | 6 |
| Bottom–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4750.1864 | -885.0526 | 7.16 | 6 |
| Botttom–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4750.1864 | 929.9221 | 7.24 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1163.3934 | -0.7979 | 7.31 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1163.3934 | 2.4195 | 7.38 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2824.1944 | -145.4422 | 7.71 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2824.1944 | 144.2786 | 7.71 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3852.3949 | -158.4957 | 8.47 | 6 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3852.3949 | 302.311 | 9.16 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 588.4406 | -7.9543 | 8.85 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 588.4406 | 13.4838 | 9.88 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1157.4303 | -1.9156 | 7.32 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1157.4303 | 0.1297 | 7.24 | 6 |
| Bottom–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4703.2856 | -904.0961 | 7.14 | 6 |
| Botttom–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4703.2856 | 959.3988 | 7.23 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2816.2513 | -181.4945 | 7.94 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2816.2513 | 147.8397 | 7.71 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 684.3975 | -21.4458 | 12.58 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 684.3975 | 10.7711 | 10.57 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2799.305 | -150.5342 | 7.69 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2799.305 | 138.9928 | 7.61 | 6 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3818.2706 | -180.8217 | 8.5 | 6 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3818.2706 | 302.127 | 9.09 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 583.4228 | -12.2634 | 9.59 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 583.4228 | 8.2577 | 8.84 | 6 |
| Bottom–Left | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2201.272 | -163.5311 | 6.35 | 6 |
| Botttom–Right | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2201.272 | 155.8634 | 6.3 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.408 | 203] 1.5 [DL + RSY] | 30959.8186 | -7275.399 | -282.5578 |
| Bottom | 0.42 | 203] 1.5 [DL + RSY] | 31606.9525 | -8296.3431 | -284.0507 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 261.5587 | 22.4686 | 67.5616 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2026.5185 | 48.7193 | 95.0027 | 275.7379 | 622.1727 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4028.3656 | 956.4487 | -152.4317 | 502.0086 | 1108.2695 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 751.6712 | 32.2418 | -28.7938 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1575.0094 | 126.1661 | 320.8066 | 233.2652 | 536.3956 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1534.324 | 186.2342 | 199.5469 | 263.9355 | 624.8051 |
| Top | Leg 7 | 1308.42 | 202] 1.5 [DL + RSX] | 235.061 | 6.8666 | -171.4575 | 20.3633 | 171.4575 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 731.8517 | 28.0624 | 29.0406 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4003.8432 | 997.82 | -184.1222 | 501.0181 | 1107.279 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1718.6111 | 14.7194 | -124.6327 | 239.0655 | 542.196 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 250.8557 | 22.0627 | 68.3718 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1522.0561 | 121.7093 | 315.3814 | 231.1263 | 534.2567 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1444.5356 | 187.4447 | 199.3145 | 260.3088 | 621.1783 |
| Top | Leg 14 | 1331.71 | 202] 1.5 [DL + RSX] | 217.7572 | 9.8102 | 174.147 | 20.3633 | 174.147 |
| Top | Leg 15 | 930.95 | 206] [0.9 DL + 1.5 RSX] | 1314.4778 | 129.5471 | 787.1402 | 222.7417 | 787.1402 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 118.4465 | 11.216 | 57.2147 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2019.681 | 40.0113 | 89.7695 | 275.4617 | 621.8965 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4193.0382 | 938.8857 | -145.0949 | 508.6601 | 1114.921 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 745.9515 | 30.286 | 29.0388 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1652.7433 | 131.476 | -321.0343 | 236.405 | 539.5354 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1421.7498 | 304.14 | 201.5011 | 259.3884 | 620.258 |
| Bottom | Leg 7 | 1199.19 | 202] 1.5 [DL + RSX] | 261.9267 | 12.4179 | -158.8433 | 20.3633 | 158.8433 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 729.8415 | 29.5812 | -27.9316 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4175.97 | 974.7788 | -171.9736 | 507.9707 | 1114.2316 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1722.8655 | 4.2765 | 106.3495 | 239.2374 | 542.3678 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 109.578 | 10.5265 | 58.6901 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1601.5868 | 146.7825 | 332.0833 | 234.3387 | 537.4691 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1331.1403 | 308.8241 | 200.6676 | 255.7285 | 616.5981 |
| Bottom | Leg 14 | 1229.39 | 202] 1.5 [DL + RSX] | 248.4117 | 6.7404 | 162.3307 | 20.3633 | 162.3307 |
| Bottom | Leg 15 | 914.21 | 206] [0.9 DL + 1.5 RSX] | 1367.0111 | 166.5551 | 779.1133 | 224.8637 | 779.1133 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 675.2417 | -11.435 | 10.58 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 675.2417 | 22.4686 | 12.65 | 6 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3302.0923 | -199.2502 | 7.92 | 6 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3302.0923 | 228.7742 | 8.07 | 6 |
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4750.2992 | -879.3807 | 7.15 | 6 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4750.2992 | 956.4487 | 7.28 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 987.1571 | -28.8604 | 7.52 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1179.6396 | 2.637 | 7.5 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2832.3848 | -130.3359 | 7.63 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2832.3848 | 126.1661 | 7.6 | 6 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3833.8324 | -255.0902 | 8.89 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3833.8324 | 186.2342 | 8.56 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 635.1902 | -10.9953 | 10 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 635.1902 | 6.8666 | 9.23 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1172.1269 | -1.6858 | 7.4 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 989.5861 | 28.0624 | 7.5 | 6 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4746.1491 | -841.7491 | 7.08 | 6 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4746.1491 | 997.82 | 7.35 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2896.5514 | -146.8936 | 7.9 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2896.5514 | 145.6738 | 7.89 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 663.3687 | -10.896 | 10.34 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 663.3687 | 22.0627 | 12.43 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2808.0154 | -134.8346 | 7.6 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2808.0154 | 121.7093 | 7.51 | 6 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3777.3158 | -251.2905 | 8.76 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3777.3158 | 187.4447 | 8.45 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 633.154 | -7.4132 | 9.3 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 633.154 | 9.8102 | 9.75 | 6 |
| Top–Left | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2208.7496 | -133.7146 | 6.17 | 6 |
| Top–Right | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2208.7496 | 128.5052 | 6.13 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 708.6194 | -22.4 | 13.06 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 708.6194 | 11.216 | 10.96 | 6 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3328.7971 | -209.9889 | 8.03 | 6 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3328.7971 | 228.5635 | 8.13 | 6 |
| Bottom–Left | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5175.5071 | -15.9594 | 6.19 | 6 |
| Botttom–Right | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5175.5071 | 62.49 | 6.27 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1205.1094 | -0.5282 | 7.56 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1205.1094 | 1.5059 | 7.6 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2945.7769 | -151.7261 | 8.05 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2945.7769 | 131.476 | 7.91 | 6 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 4024.6116 | -143.5361 | 8.74 | 6 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4024.6116 | 304.14 | 9.51 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 604.7842 | -6.2773 | 8.74 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 604.7842 | 12.4179 | 9.89 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1197.4499 | -1.1594 | 7.54 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1197.4499 | 0.6848 | 7.52 | 6 |
| Bottom–Left | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 5171.8421 | -44.9772 | 6.23 | 6 |
| Botttom–Right | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 5171.8421 | 112.4536 | 6.35 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2932.4876 | -158.53 | 8.06 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2932.4876 | 137.2808 | 7.92 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 694.6749 | -22.0283 | 12.81 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 694.6749 | 10.5265 | 10.66 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2925.0832 | -136.3885 | 7.89 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2925.0832 | 146.7825 | 7.96 | 6 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3991.8708 | -156.7202 | 8.74 | 6 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3991.8708 | 308.8241 | 9.47 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 597.1674 | -11.2276 | 9.57 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 597.1674 | 6.7404 | 8.73 | 6 |
| Bottom–Left | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2296.4657 | -172.6295 | 6.64 | 6 |
| Botttom–Right | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2296.4657 | 165.0365 | 6.59 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.425 | 203] 1.5 [DL + RSY] | 32424.5878 | -7163.7463 | -287.0272 |
| Bottom | 0.438 | 203] 1.5 [DL + RSY] | 33071.7217 | -8383.6728 | -265.7162 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 295.8763 | 23.016 | 70.8998 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1979.3504 | 204.2207 | 98.5482 | 273.8327 | 620.2675 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4184.2839 | 969.9137 | -143.5754 | 508.3065 | 1114.5674 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 782.0709 | 30.3466 | -27.9794 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1646.4059 | 112.6922 | 333.8296 | 236.149 | 539.2795 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1669.2173 | 189.9386 | 205.7266 | 269.3842 | 630.2537 |
| Top | Leg 7 | 1323.42 | 202] 1.5 [DL + RSX] | 243.2296 | 7.1934 | -173.1901 | 20.3633 | 173.1901 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 760.3286 | 26.8072 | 28.1708 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4158.5989 | 1012.1326 | -177.6363 | 507.269 | 1113.5299 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1822.7563 | 18.0543 | -128.9359 | 243.2722 | 546.4026 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 284.0786 | 22.6019 | 71.551 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1594.2209 | 130.1172 | -328.2563 | 234.0412 | 537.1716 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1579.9076 | 199.4768 | 202.6623 | 265.7767 | 626.6463 |
| Top | Leg 14 | 1347.44 | 202] 1.5 [DL + RSX] | 223.9513 | 9.8347 | 175.9632 | 20.3633 | 175.9632 |
| Top | Leg 15 | 915.18 | 206] [0.9 DL + 1.5 RSX] | 1370.5238 | 125.3637 | 779.8445 | 225.0055 | 779.8445 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 129.0666 | 11.1242 | 58.4361 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2015.0914 | 238.6314 | 103.0924 | 275.2763 | 621.7111 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4367.3551 | 942.8954 | -146.9866 | 508.9413 | 1115.2022 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 777.2067 | 30.2725 | 28.5711 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1724.4001 | 142.9219 | 314.2428 | 239.2994 | 542.4298 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1472.1468 | 302.0836 | 209.1463 | 261.424 | 622.2936 |
| Bottom | Leg 7 | 1182.29 | 202] 1.5 [DL + RSX] | 283.2248 | 12.6335 | -156.8921 | 20.3633 | 156.8921 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 759.5693 | 27.9974 | -27.5263 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4351.8706 | 981.8542 | -178.1953 | 508.9413 | 1115.2022 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1826.9292 | -0.708 | -112.7964 | 243.4407 | 546.5712 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 120.9815 | 10.3522 | 59.6937 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1672.3093 | 146.6714 | 324.5188 | 237.1953 | 540.3257 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1381.1097 | 305.3726 | 205.5065 | 257.7469 | 618.6164 |
| Bottom | Leg 14 | 1211.13 | 202] 1.5 [DL + RSX] | 269.8358 | 6.5618 | 160.2226 | 20.3633 | 160.2226 |
| Bottom | Leg 15 | 946.1 | 206] [0.9 DL + 1.5 RSX] | 1426.7971 | 178.8193 | 800.859 | 227.2785 | 800.859 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 698.6206 | -10.9745 | 10.79 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 698.6206 | 23.016 | 13.05 | 6 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3432.7781 | -189.2157 | 8.14 | 6 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3432.7781 | 204.2207 | 8.22 | 6 |
| Top–Left | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5176.1956 | -4.5583 | 6.17 | 6 |
| Top–Right | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5176.1956 | 81.5613 | 6.3 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1216.1211 | -0.1036 | 7.61 | 6 |
| Top–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1216.1211 | 2.9273 | 7.74 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2955.8956 | -137.4319 | 7.97 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2955.8956 | 112.6922 | 7.8 | 6 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3975.6061 | -249.7811 | 9.15 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3975.6061 | 189.9386 | 8.86 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 666.5179 | -11.0836 | 10.41 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 666.5179 | 7.1934 | 9.68 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1207.6323 | -1.6123 | 7.62 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1029.9278 | 26.8072 | 7.69 | 6 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4948.4967 | -846.2967 | 7.33 | 6 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 5205.1788 | 125.0815 | 6.41 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 3008.2896 | -127.118 | 8.03 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 3008.2896 | 139.6882 | 8.11 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 685.6212 | -10.3637 | 10.51 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 685.6212 | 22.6019 | 12.81 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2935.7984 | -120.0196 | 7.81 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2935.7984 | 130.1172 | 7.88 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3921.724 | -241.668 | 9 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3921.724 | 199.4768 | 8.8 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 661.5976 | -7.6487 | 9.7 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 661.5976 | 9.8347 | 10.11 | 6 |
| Top–Left | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2304.2858 | -129.6321 | 6.37 | 6 |
| Top–Right | Leg 15 | 300 | 202] 1.5 [DL + RSX] | 2304.2858 | 124.2965 | 6.33 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 737.373 | -21.7201 | 13.29 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 737.373 | 11.1242 | 11.3 | 6 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3468.3523 | -208.8743 | 8.31 | 6 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3468.3523 | 238.6314 | 8.47 | 6 |
| Bottom–Left | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5419.1355 | -9.553 | 6.47 | 6 |
| Botttom–Right | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5419.1355 | 63.5192 | 6.56 | 6 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1019.1671 | -27.7312 | 7.67 | 6 |
| Botttom–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1248.6465 | 2.3763 | 7.92 | 6 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 3073.764 | -151.3511 | 8.35 | 6 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 3073.764 | 142.9219 | 8.29 | 6 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4190.6288 | -151.6637 | 9.11 | 6 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4190.6288 | 302.0836 | 9.83 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 625.1997 | -6.2037 | 8.98 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 625.1997 | 12.6335 | 10.18 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1240.0835 | -0.196 | 7.76 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1023.2266 | 27.9974 | 7.71 | 6 |
| Bottom–Left | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 5416.7548 | -33.8345 | 6.51 | 6 |
| Botttom–Right | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 5416.7548 | 113.3985 | 6.64 | 6 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 3056.7892 | -165.3679 | 8.4 | 6 |
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 3056.7892 | 137.7025 | 8.21 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 724.7156 | -21.3885 | 13.07 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 724.7156 | 10.3522 | 11 | 6 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 3054.8641 | -147.6282 | 8.28 | 6 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 3054.8641 | 146.6714 | 8.27 | 6 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4159.5903 | -165.7262 | 9.11 | 6 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4159.5903 | 305.3726 | 9.78 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 618.3545 | -11.4556 | 9.88 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 618.3545 | 6.5618 | 8.96 | 6 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2518.9225 | -8.3955 | 6.05 | 6 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2518.9225 | 0.9409 | 6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.381 | 203] 1.5 [DL + RSY] | 33892.6088 | -7063.6025 | -280.6601 |
| Bottom | 0.392 | 203] 1.5 [DL + RSY] | 34539.7427 | -8539.099 | -240.5385 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 314.759 | 22.4682 | 69.4365 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2066.4034 | 212.6659 | 109.1642 | 345.6348 | 692.0696 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4360.3463 | 977.3526 | -154.6708 | 634.2474 | 1240.5083 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 810.0187 | 30.4967 | -27.6086 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1715.8243 | 117.7985 | 353.7437 | 297.7854 | 600.9159 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1744.7091 | 187.1396 | 214.7567 | 339.5091 | 700.3787 |
| Top | Leg 7 | 1287.88 | 202] 1.5 [DL + RSX] | 252.5932 | 7.5539 | -169.0857 | 20.3633 | 169.0857 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 787.0446 | 26.1925 | 27.6284 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4333.7634 | 1016.6956 | -192.3336 | 634.2474 | 1240.5083 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1937.5698 | 15.6276 | -136.0976 | 308.9475 | 612.0779 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 303.4202 | 22.0468 | 70.0089 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1662.5573 | 127.9999 | -349.1202 | 295.1041 | 598.2346 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1655.4047 | 194.7608 | 212.3276 | 335.0138 | 695.8833 |
| Top | Leg 14 | 1309.72 | 202] 1.5 [DL + RSX] | 233.6207 | 9.7492 | 171.6073 | 20.3633 | 171.6073 |
| Top | Leg 15 | 859.85 | 206] [0.9 DL + 1.5 RSX] | 1430.6299 | 123.2683 | 804.7227 | 283.4296 | 804.7227 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 132.7347 | 11.0845 | 58.6593 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2091.6836 | 252.979 | 107.496 | 346.9074 | 693.3421 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4532.2215 | 947.5778 | -168.109 | 634.2474 | 1240.5083 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 806.9123 | 29.5998 | 27.6919 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1778.57 | 154.1753 | -335.8564 | 300.9439 | 604.0743 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1502.1231 | 298.0424 | 215.7454 | 327.298 | 688.1676 |
| Bottom | Leg 7 | 1158.28 | 202] 1.5 [DL + RSX] | 297.3088 | 12.2728 | -154.12 | 20.3633 | 154.12 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 788.0199 | 27.6419 | -26.7611 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4519.4755 | 989.4295 | -200.0038 | 634.2474 | 1240.5083 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1930.0003 | -1.8224 | -115.4814 | 308.5664 | 611.6969 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 125.3086 | 10.3148 | 59.8083 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1725.2128 | 154.8724 | 347.6227 | 298.258 | 601.3885 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1410.1344 | 300.8429 | 212.639 | 322.6676 | 683.5371 |
| Bottom | Leg 14 | 1186.73 | 202] 1.5 [DL + RSX] | 283.9357 | 6.9965 | 157.4051 | 20.3633 | 157.4051 |
| Bottom | Leg 15 | 933.38 | 206] [0.9 DL + 1.5 RSX] | 1486.1307 | 194.2438 | 852.0975 | 286.2233 | 852.0975 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 711.367 | -10.9852 | 10.95 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 711.367 | 22.4682 | 13.1 | 6 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3574.9237 | -186.8927 | 8.42 | 6 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3574.9237 | 212.6659 | 8.56 | 6 |
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 5183.2334 | -892.6593 | 7.69 | 6 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 5421.5054 | 81.1948 | 6.59 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1072.9127 | -26.7095 | 7.96 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1255.3478 | 3.4417 | 8.01 | 6 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 3085.7179 | -135.1538 | 8.27 | 6 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 3085.7179 | 117.7985 | 8.15 | 6 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 4109.0423 | -245.8057 | 9.4 | 6 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 4109.0423 | 187.1396 | 9.12 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 696.901 | -10.9116 | 10.76 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 696.901 | 7.5539 | 10.13 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1246.7471 | -1.889 | 7.88 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1076.2779 | 26.1925 | 7.95 | 6 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 5181.6959 | -839.2867 | 7.6 | 6 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 5456.2999 | 132.6744 | 6.72 | 6 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 3131.5144 | -132.5023 | 8.36 | 6 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 3131.5144 | 138.2882 | 8.4 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 699.4003 | -10.3695 | 10.69 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 699.4003 | 22.0468 | 12.88 | 6 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 3067.2434 | -124.9205 | 8.15 | 6 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 3067.2434 | 127.9999 | 8.17 | 6 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 4058.6127 | -238.9336 | 9.26 | 6 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 4058.6127 | 194.7608 | 9.05 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 692.7691 | -7.8759 | 10.14 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 692.7691 | 9.7492 | 10.49 | 6 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2508.8828 | -5.7139 | 6.01 | 6 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2405.8189 | 122.2357 | 6.56 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 774.0834 | -20.8722 | 13.59 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 774.0834 | 11.0845 | 11.75 | 6 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3621.7571 | -221.1934 | 8.7 | 6 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3621.7571 | 252.979 | 8.86 | 6 |
| Bottom–Left | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5665.0296 | -6.7539 | 6.76 | 6 |
| Botttom–Right | Leg 3 | 600 | 202] 1.5 [DL + RSX] | 5665.0296 | 66.0438 | 6.86 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1296.4636 | -0.0179 | 8.1 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1296.4636 | 2.0737 | 8.2 | 6 |
| Bottom–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3208.7532 | -159.6388 | 8.73 | 6 |
| Botttom–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3208.7532 | 154.1753 | 8.69 | 6 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4384.7169 | -157.5356 | 9.53 | 6 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4384.7169 | 298.0424 | 10.2 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 646.6775 | -6.7426 | 9.35 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 646.6775 | 12.2728 | 10.38 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1287.2951 | -0.1625 | 8.05 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1072.1166 | 27.6419 | 8 | 6 |
| Bottom–Left | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 5663.6725 | -38.4891 | 6.81 | 6 |
| Botttom–Right | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 5663.6725 | 124.0184 | 6.95 | 6 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3195.145 | -174.1388 | 8.79 | 6 |
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3195.145 | 146.8499 | 8.61 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 761.86 | -20.5312 | 13.37 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 761.86 | 10.3148 | 11.46 | 6 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3191.2424 | -159.0242 | 8.68 | 6 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3191.2424 | 154.8724 | 8.65 | 6 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4356.4463 | -171.8553 | 9.54 | 6 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4356.4463 | 300.8429 | 10.16 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 641.0671 | -11.1366 | 10.1 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 641.0671 | 6.9965 | 9.33 | 6 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2613.5771 | -8.3392 | 6.28 | 6 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2613.5771 | 0.896 | 6.23 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.396 | 203] 1.5 [DL + RSY] | 35360.9996 | -6936.185 | -270.904 |
| Bottom | 0.409 | 203] 1.5 [DL + RSY] | 36008.1335 | -8845.5166 | -206.8375 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 334.2574 | 21.8236 | 68.5655 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2136.0477 | 223.502 | 122.1764 | 349.1405 | 695.5753 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4525.4063 | 983.8651 | -182.6043 | 634.2474 | 1240.5083 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 835.7819 | 30.0274 | -27.0489 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1767.7958 | 124.7054 | 377.822 | 300.4015 | 603.532 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1800.3597 | 189.3269 | 225.8116 | 342.3104 | 703.1799 |
| Top | Leg 7 | 1249.01 | 202] 1.5 [DL + RSX] | 257.0163 | 7.7276 | -164.5968 | 20.3633 | 164.5968 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 811.785 | 25.9784 | 26.9718 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4499.4405 | 1017.3395 | -220.9771 | 634.2474 | 1240.5083 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2062.857 | 14.6874 | -145.7471 | 315.2541 | 618.3845 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 322.844 | 21.3805 | 69.1088 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1713.2772 | 130.2603 | -374.4673 | 297.6572 | 600.7877 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1710.2637 | 194.7337 | 224.4242 | 337.7752 | 698.6448 |
| Top | Leg 14 | 1269.47 | 202] 1.5 [DL + RSX] | 238.1551 | 9.7212 | 166.9598 | 20.3633 | 166.9598 |
| Top | Leg 15 | 944.1 | 206] [0.9 DL + 1.5 RSX] | 1489.8528 | 123.0943 | 858.7787 | 286.4107 | 858.7787 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 133.2758 | 10.9208 | 58.2582 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2147.5466 | 267.1922 | 115.2542 | 349.7193 | 696.1541 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4684.0985 | 966.5535 | -205.3732 | 634.2474 | 1240.5083 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 830.9468 | 29.4495 | 27.3842 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1814.0985 | 166.2388 | -372.8655 | 302.7323 | 605.8627 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1507.0813 | 295.97 | 225.7295 | 327.5476 | 688.4172 |
| Bottom | Leg 7 | 1118.53 | 202] 1.5 [DL + RSX] | 306.4188 | 12.0987 | -149.5294 | 20.3633 | 149.5294 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 810.7378 | 27.3672 | -26.4759 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4675.4503 | 1013.3338 | -235.0789 | 634.2474 | 1240.5083 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2021.8151 | -2.9809 | -122.8959 | 313.1881 | 616.3186 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 126.1702 | 10.1729 | 59.3343 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1759.3675 | 168.2541 | 383.9009 | 299.9773 | 603.1077 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1413.1 | 299.0011 | 223.4864 | 322.8168 | 683.6864 |
| Bottom | Leg 14 | 1146.75 | 202] 1.5 [DL + RSX] | 292.4112 | 7.2401 | 152.7879 | 20.3633 | 152.7879 |
| Bottom | Leg 15 | 1058.29 | 206] [0.9 DL + 1.5 RSX] | 1543.3356 | 215.7361 | 930.7013 | 289.1029 | 930.7013 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 724.4019 | -10.9815 | 11.11 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 724.4019 | 21.8236 | 13.15 | 6 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3731.6519 | -194.0707 | 8.79 | 6 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3731.6519 | 223.502 | 8.94 | 6 |
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 5413.9327 | -895.8031 | 7.97 | 6 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 5668.2962 | 85.5075 | 6.89 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1122.6771 | -26.4667 | 8.26 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1297.5067 | 3.4354 | 8.27 | 6 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3222.969 | -137.3024 | 8.61 | 6 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3222.969 | 124.7054 | 8.52 | 6 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4269.2371 | -241.0659 | 9.7 | 6 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4269.2371 | 189.3269 | 9.45 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 728.9385 | -10.8228 | 11.14 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 728.9385 | 7.7276 | 10.56 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1289.0984 | -1.7103 | 8.14 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1127.6397 | 25.9784 | 8.27 | 6 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 5412.514 | -836.5345 | 7.87 | 6 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 5708.87 | 134.5147 | 7.03 | 6 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3268.7742 | -139.5475 | 8.73 | 6 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3268.7742 | 143.5223 | 8.76 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 713.3299 | -10.3983 | 10.87 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 713.3299 | 21.3805 | 12.93 | 6 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3205.9405 | -131.6981 | 8.53 | 6 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3205.9405 | 130.2603 | 8.52 | 6 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4223.2854 | -235.0002 | 9.57 | 6 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4223.2854 | 194.7337 | 9.38 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 725.9395 | -7.965 | 10.57 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 725.9395 | 9.7212 | 10.9 | 6 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2601.7383 | -5.6712 | 6.23 | 6 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2601.7383 | 0.7661 | 6.2 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 815.902 | -19.9767 | 13.94 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 815.902 | 10.9208 | 12.25 | 6 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3790.0394 | -234.8604 | 9.12 | 6 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3790.0394 | 267.1922 | 9.29 | 6 |
| Bottom–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5640.4466 | -903.3534 | 8.25 | 6 |
| Botttom–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5640.4466 | 966.5535 | 8.36 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1348.5949 | -0.0194 | 8.43 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1348.5949 | 2.1306 | 8.53 | 6 |
| Bottom–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3361.7044 | -173.0705 | 9.18 | 6 |
| Botttom–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3361.7044 | 166.2388 | 9.13 | 6 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4610.2277 | -161.2615 | 9.99 | 6 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4610.2277 | 295.97 | 10.64 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 673.2984 | -7.0686 | 9.74 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 673.2984 | 12.0987 | 10.68 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1338.704 | -0.3053 | 8.38 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1124.1113 | 27.3672 | 8.31 | 6 |
| Bottom–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5588.7949 | -922.1504 | 8.22 | 6 |
| Botttom–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5588.7949 | 1013.3338 | 8.38 | 6 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3346.5774 | -182.6791 | 9.21 | 6 |
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3346.5774 | 156.3024 | 9.03 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 803.6194 | -19.6225 | 13.72 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 803.6194 | 10.1729 | 11.95 | 6 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3346.1204 | -171.2246 | 9.13 | 6 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3346.1204 | 168.2541 | 9.11 | 6 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4585.2073 | -174.9682 | 10.01 | 6 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4585.2073 | 299.0011 | 10.61 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 668.7351 | -10.9929 | 10.42 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 668.7351 | 7.2401 | 9.72 | 6 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2697.3041 | -8.3477 | 6.48 | 6 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2697.3041 | 0.7687 | 6.43 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.411 | 203] 1.5 [DL + RSY] | 36825.241 | -6866.7629 | -253.3227 |
| Bottom | 0.426 | 203] 1.5 [DL + RSY] | 37472.3749 | -9471.915 | -161.5366 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 354.7526 | 20.9322 | 67.6532 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2183.7837 | 232.4072 | 139.5009 | 351.5434 | 697.9782 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4677.5298 | 1002.0582 | -222.9729 | 634.2474 | 1240.5083 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 855.4758 | 29.8398 | -26.763 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1800.9347 | 130.1313 | 417.207 | 302.0696 | 605.2001 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1829.7036 | 192.6722 | 240.9711 | 343.7875 | 704.657 |
| Top | Leg 7 | 1203.63 | 202] 1.5 [DL + RSX] | 256.5649 | 7.9939 | -159.3569 | 20.3633 | 159.3569 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 830.3993 | 25.8447 | 26.5872 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4653.8805 | 1028.4431 | -259.8963 | 634.2474 | 1240.5083 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2192.1547 | 13.4162 | -156.7221 | 317.1237 | 620.2542 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 342.7707 | 20.4717 | 68.1605 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1745.0494 | 135.6498 | -415.1047 | 299.2565 | 602.387 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1737.4608 | 196.5049 | 240.2663 | 339.1442 | 700.0138 |
| Top | Leg 14 | 1222.71 | 202] 1.5 [DL + RSX] | 237.3338 | 9.5432 | 161.56 | 20.3633 | 161.56 |
| Top | Leg 15 | 1073.57 | 206] [0.9 DL + 1.5 RSX] | 1546.9699 | 124.4295 | 940.1481 | 289.2858 | 940.1481 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 129.0202 | 10.6785 | 57.6541 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2176.4138 | 283.149 | 128.2963 | 351.1724 | 697.6072 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4824.7311 | 1024.8615 | -253.6702 | 634.2474 | 1240.5083 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 847.1573 | 29.8053 | 27.4331 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1822.0777 | 182.7441 | -421.4052 | 303.1339 | 606.2644 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1470.7933 | 293.4956 | 239.6204 | 325.721 | 686.5905 |
| Bottom | Leg 7 | 1065.06 | 202] 1.5 [DL + RSX] | 307.2582 | 11.9422 | -143.3545 | 20.3633 | 143.3545 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 825.5038 | 27.4861 | -26.5596 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4821.0956 | 1077.2502 | -280.1209 | 634.2474 | 1240.5083 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2087.7278 | -4.2062 | -132.9623 | 316.506 | 619.6364 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 122.0992 | 9.9597 | 58.6539 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1765.5423 | 186.0662 | 431.5113 | 300.2881 | 603.4185 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1373.724 | 296.8293 | 237.9122 | 320.8348 | 681.7043 |
| Bottom | Leg 14 | 1092.67 | 202] 1.5 [DL + RSX] | 292.2889 | 7.4467 | 146.5434 | 20.3633 | 146.5434 |
| Bottom | Leg 15 | 1226.73 | 206] [0.9 DL + 1.5 RSX] | 1599.0379 | 245.6498 | 1035.6261 | 291.9067 | 1035.6261 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 737.3157 | -10.9329 | 11.27 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 737.3157 | 20.9322 | 13.14 | 6 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3904.1821 | -200.649 | 9.18 | 6 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3904.1821 | 232.4072 | 9.34 | 6 |
| Top–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5642.6731 | -911.9862 | 8.27 | 6 |
| Top–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5642.6731 | 1002.0582 | 8.42 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1176.0804 | -26.2734 | 8.58 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1343.5191 | 3.5331 | 8.56 | 6 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3378.3626 | -142.4996 | 9.01 | 6 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3378.3626 | 130.1313 | 8.93 | 6 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4461.1786 | -232.4399 | 10.04 | 6 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4461.1786 | 192.6722 | 9.85 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 765.7594 | -10.5775 | 11.56 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 765.7594 | 7.9939 | 11.07 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1335.2085 | -1.5717 | 8.42 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1182.6641 | 25.8447 | 8.6 | 6 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5640.4294 | -844.8424 | 8.15 | 6 |
| Top–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5640.4294 | 1028.4431 | 8.46 | 6 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3419.201 | -145.7413 | 9.13 | 6 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3419.201 | 148.2399 | 9.15 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 726.9875 | -10.3923 | 11.04 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 726.9875 | 20.4717 | 12.93 | 6 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3363.3349 | -136.8969 | 8.94 | 6 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3363.3349 | 135.6498 | 8.93 | 6 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4420.374 | -226.503 | 9.93 | 6 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4420.374 | 196.5049 | 9.78 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 763.6681 | -8.1577 | 11.08 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 763.6681 | 9.5432 | 11.34 | 6 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2684.5941 | -5.7356 | 6.43 | 6 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2684.5941 | 1.0651 | 6.4 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 862.4183 | -18.8256 | 14.31 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 862.4183 | 10.6785 | 12.78 | 6 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3980.5695 | -250.951 | 9.6 | 6 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3980.5695 | 283.149 | 9.77 | 6 |
| Bottom–Left | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6215.2207 | -13.9839 | 7.42 | 6 |
| Botttom–Right | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6215.2207 | 80.5575 | 7.54 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1411.0019 | -0.0204 | 8.82 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1411.0019 | 2.2875 | 8.93 | 6 |
| Bottom–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3540.6244 | -190.9634 | 9.73 | 6 |
| Botttom–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3540.6244 | 182.7441 | 9.67 | 6 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4876.1766 | -165.3755 | 10.55 | 6 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4876.1766 | 293.4956 | 11.16 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 708.1005 | -7.3635 | 10.23 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 708.1005 | 11.9422 | 11.09 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1400.1809 | -0.4894 | 8.77 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1181.9541 | 27.4861 | 8.68 | 6 |
| Bottom–Left | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 6217.9496 | -60.9435 | 7.51 | 6 |
| Botttom–Right | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 6217.9496 | 157.5209 | 7.67 | 6 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3518.1495 | -191.875 | 9.68 | 6 |
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3518.1495 | 167.0977 | 9.51 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 850.0371 | -18.4671 | 14.09 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 850.0371 | 9.9597 | 12.49 | 6 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3527.2589 | -187.9043 | 9.68 | 6 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3527.2589 | 186.0662 | 9.66 | 6 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4854.5357 | -178.3098 | 10.56 | 6 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4854.5357 | 296.8293 | 11.13 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 704.6692 | -10.8736 | 10.85 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 704.6692 | 7.4467 | 10.2 | 6 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2770.3944 | -8.4111 | 6.65 | 6 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2770.3944 | 0.6388 | 6.6 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.427 | 203] 1.5 [DL + RSY] | 38278.4797 | -7091.6858 | -220.9906 |
| Bottom | 0.445 | 203] 1.5 [DL + RSY] | 38925.6136 | -10594.2658 | -102.816 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 372.1962 | 19.8168 | 66.1989 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2202.4398 | 239.5568 | 161.7189 | 352.4825 | 698.9173 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4818.5248 | 1054.0189 | -270.7269 | 634.2474 | 1240.5083 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 866.8755 | 29.7444 | -26.8097 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1806.2579 | 134.9257 | 471.5879 | 302.3376 | 605.468 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1811.2619 | 193.3828 | 260.1391 | 342.8592 | 703.7287 |
| Top | Leg 7 | 1143.62 | 202] 1.5 [DL + RSX] | 248.5904 | 8.2511 | -152.4263 | 20.3633 | 152.4263 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 840.6373 | 25.7928 | 26.5442 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4798.638 | 1072.7948 | -305.2142 | 634.2474 | 1240.5083 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2307.6367 | 11.8987 | -167.9261 | 317.1237 | 620.2542 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 359.4327 | 19.347 | 66.6739 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1748.5601 | 141.301 | -470.6087 | 299.4333 | 602.5637 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1715.508 | 195.7219 | 259.8968 | 338.0392 | 698.9088 |
| Top | Leg 14 | 1161.21 | 202] 1.5 [DL + RSX] | 228.8108 | 9.2919 | 154.4583 | 20.3633 | 154.4583 |
| Top | Leg 15 | 1246.23 | 206] [0.9 DL + 1.5 RSX] | 1602.6312 | 126.1496 | 1047.627 | 292.0876 | 1047.627 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 117.5124 | 10.2535 | 56.6919 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2165.5468 | 305.6979 | 147.8017 | 350.6254 | 697.0602 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4954.4583 | 1151.6988 | -308.3885 | 634.2474 | 1240.5083 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 853.9402 | 30.9859 | 27.8416 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1789.6979 | 207.0032 | -482.1856 | 301.504 | 604.6344 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1370.976 | 289.6765 | 257.3148 | 320.6964 | 681.566 |
| Bottom | Leg 7 | 994.61 | 202] 1.5 [DL + RSX] | 295.1651 | 11.7894 | -135.2193 | 20.3633 | 135.2193 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 830.7492 | 28.4047 | -26.9902 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4956.808 | 1208.6081 | -330.9512 | 634.2474 | 1240.5083 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2110.7538 | -5.5296 | -144.2714 | 317.1237 | 620.2542 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 110.5438 | 9.5736 | 57.6117 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1730.8758 | 210.883 | 491.2601 | 298.5431 | 601.6735 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1270.0849 | 293.1183 | 255.9526 | 315.6179 | 676.4874 |
| Bottom | Leg 14 | 1021.38 | 202] 1.5 [DL + RSX] | 279.1171 | 7.7096 | 138.3109 | 20.3633 | 138.3109 |
| Bottom | Leg 15 | 1431.94 | 206] [0.9 DL + 1.5 RSX] | 1653.4899 | 286.0658 | 1162.7741 | 294.6477 | 1162.7741 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 751.9979 | -10.7333 | 11.41 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 751.9979 | 19.8168 | 13.12 | 6 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 4100.3877 | -205.9102 | 9.61 | 6 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4100.3877 | 239.5568 | 9.79 | 6 |
| Top–Left | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6222.3386 | -10.2595 | 7.42 | 6 |
| Top–Right | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6222.3386 | 101.7613 | 7.58 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1400.787 | -0.0533 | 8.76 | 6 |
| Top–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1400.787 | 3.6097 | 8.92 | 6 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3559.86 | -148.002 | 9.48 | 6 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3559.86 | 134.9257 | 9.39 | 6 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4698.9407 | -220.8765 | 10.46 | 6 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4698.9407 | 193.3828 | 10.33 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 809.8481 | -10.2536 | 12.05 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 809.8481 | 8.2511 | 11.67 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1392.3222 | -1.4259 | 8.77 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1244.0874 | 25.7928 | 8.98 | 6 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5869.0564 | -886.9414 | 8.5 | 6 |
| Top–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 6277.9634 | 133.361 | 7.7 | 6 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3589.8408 | -151.2239 | 9.58 | 6 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3589.8408 | 152.5872 | 9.59 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 742.5269 | -10.2393 | 11.2 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 742.5269 | 19.347 | 12.91 | 6 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3547.1005 | -141.4937 | 9.41 | 6 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3547.1005 | 141.301 | 9.41 | 6 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4663.6774 | -214.9403 | 10.36 | 6 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4663.6774 | 195.7219 | 10.27 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 808.6759 | -8.3503 | 11.67 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 808.6759 | 9.2919 | 11.85 | 6 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2758.8838 | -5.8832 | 6.61 | 6 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2758.8838 | 1.4109 | 6.58 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 915.9316 | -17.3871 | 14.71 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 915.9316 | 10.2535 | 13.37 | 6 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4206.0843 | -273.9624 | 10.19 | 6 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4206.0843 | 305.6979 | 10.35 | 6 |
| Bottom–Left | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6544.4792 | -19.3797 | 7.82 | 6 |
| Botttom–Right | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6544.4792 | 88.8038 | 7.94 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1490.5433 | -0.0354 | 9.32 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1490.5433 | 2.4976 | 9.43 | 6 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3756.3735 | -215.9701 | 10.41 | 6 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3756.3735 | 207.0032 | 10.35 | 6 |
| Bottom–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5201.3868 | -169.2973 | 11.22 | 6 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5201.3868 | 289.6765 | 11.79 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 755.2788 | -7.7169 | 10.89 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 755.2788 | 11.7894 | 11.65 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1478.6666 | -0.6372 | 9.27 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1247.9637 | 28.4047 | 9.13 | 6 |
| Bottom–Left | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 6549.6746 | -73.3549 | 7.92 | 6 |
| Botttom–Right | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 6549.6746 | 174.71 | 8.09 | 6 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3722.5431 | -205.0881 | 10.26 | 6 |
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3722.5431 | 181.8744 | 10.1 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 903.4542 | -17.0353 | 14.49 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 903.4542 | 9.5736 | 13.09 | 6 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3745.2771 | -212.4188 | 10.36 | 6 |
| Botttom–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3745.2771 | 210.883 | 10.35 | 6 |
| Bottom–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5183.0266 | -181.5522 | 11.24 | 6 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5183.0266 | 293.1183 | 11.77 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 753.0427 | -10.7607 | 11.43 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 753.0427 | 7.7096 | 10.86 | 6 |
| Bottom–Left | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 2778.5209 | -292.4451 | 8.6 | 6 |
| Botttom–Right | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 2778.5209 | 284.471 | 8.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.375 | 203] 1.5 [DL + RSY] | 39711.1544 | -7925.8679 | -169.3671 |
| Bottom | 0.392 | 203] 1.5 [DL + RSY] | 40358.2883 | -12326.0559 | -28.0402 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 379.1898 | 18.3851 | 64.0031 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2178.7556 | 247.8889 | 188.4362 | 412.1214 | 758.5562 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4948.5862 | 1167.3055 | -321.7771 | 744.0767 | 1350.3376 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 868.6352 | 29.4877 | -27.2248 | 53.0289 | 168.5071 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1771.1193 | 140.2839 | 537.61 | 352.6167 | 655.7472 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1715.9383 | 190.8139 | 282.1717 | 396.601 | 757.4706 |
| Top | Leg 7 | 1063.06 | 202] 1.5 [DL + RSX] | 229.6198 | 8.4131 | -143.1237 | 20.3633 | 143.1237 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 841.1814 | 25.6213 | 26.8505 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4934.267 | 1180.3927 | -353.1061 | 744.0767 | 1350.3376 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1807.879 | 158.4642 | -178.0325 | 354.7875 | 657.918 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 365.4757 | 17.9117 | 64.4548 | 20.3633 | 78.1025 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1711.1311 | 147.1322 | -537.5346 | 349.0742 | 652.2046 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1615.8273 | 191.4862 | 282.1453 | 390.6891 | 751.5587 |
| Top | Leg 14 | 1078.87 | 202] 1.5 [DL + RSX] | 209.2869 | 8.9522 | 144.9497 | 20.3633 | 144.9497 |
| Top | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1657.06 | 127.5853 | -1176.7872 | 345.8811 | 649.0115 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 95.3104 | 9.5427 | 55.0959 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2098.6214 | 341.9008 | 174.3278 | 407.3892 | 753.8239 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5072.4429 | 1367.5796 | -365.6255 | 744.0767 | 1350.3376 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 851.5589 | 33.165 | 28.5072 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1704.4313 | 242.5257 | -553.9518 | 348.6785 | 651.809 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1182.7766 | 283.6434 | 277.9816 | 365.1159 | 725.9854 |
| Bottom | Leg 7 | 901.63 | 202] 1.5 [DL + RSX] | 265.695 | 11.6815 | -124.4819 | 20.3633 | 124.4819 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 826.7304 | 30.2817 | -27.6792 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5082.089 | 1426.9415 | -383.4152 | 744.0767 | 1350.3376 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2080.9002 | -6.0782 | -155.3184 | 370.9104 | 674.0409 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 87.9371 | 8.9161 | 55.9307 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1643 | 246.2364 | 561.9645 | 345.0508 | 648.1812 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1077.7919 | 286.7109 | 276.7602 | 358.9161 | 719.7857 |
| Bottom | Leg 14 | 927.33 | 202] 1.5 [DL + RSX] | 248.7263 | 8.1091 | 127.4501 | 20.3633 | 127.4501 |
| Bottom | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1706.331 | 338.3873 | 1302.2176 | 348.7907 | 651.9212 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 775.6544 | -10.3335 | 11.63 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 775.6544 | 18.3851 | 13.14 | 6 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4333.2284 | -212.4784 | 10.13 | 6 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4333.2284 | 247.8889 | 10.32 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6553.9136 | -17.4724 | 7.83 | 6 |
| Top–Right | Leg 3 | 700 | 202] 1.5 [DL + RSX] | 6553.9136 | 109.6358 | 7.99 | 6 |
| Top–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1478.0569 | -0.1316 | 9.24 | 6 |
| Top–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1478.0569 | 3.6249 | 9.41 | 6 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3778.2349 | -153.805 | 10.04 | 6 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3778.2349 | 140.2839 | 9.95 | 6 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 5008.4736 | -205.8078 | 11 | 6 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 5008.4736 | 190.8139 | 10.93 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 864.2274 | -9.8352 | 12.65 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 864.2274 | 8.4131 | 12.38 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1469.1004 | -1.2722 | 9.24 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1313.8458 | 25.6213 | 9.41 | 6 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 6099.9342 | -993.366 | 8.95 | 6 |
| Top–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 6618.5656 | 130.0934 | 8.1 | 6 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3793.4494 | -158.5898 | 10.11 | 6 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3793.4494 | 158.4642 | 10.11 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 767.0199 | -9.8944 | 11.44 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 767.0199 | 17.9117 | 12.95 | 6 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3767.7829 | -146.7658 | 9.97 | 6 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3767.7829 | 147.1322 | 9.97 | 6 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4978.7603 | -200.0104 | 10.92 | 6 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4978.7603 | 191.4862 | 10.88 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 863.9989 | -8.4524 | 12.38 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 863.9989 | 8.9522 | 12.48 | 6 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2830.4231 | -6.097 | 6.78 | 6 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2830.4231 | 1.7607 | 6.75 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 979.6371 | -15.6157 | 15.17 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 979.6371 | 9.5427 | 14.03 | 6 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4483.5869 | -310.0623 | 10.96 | 6 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4483.5869 | 341.9008 | 11.12 | 6 |
| Bottom–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6343.0089 | -1294.4858 | 9.75 | 6 |
| Botttom–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6343.0089 | 1367.5796 | 9.88 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1592.2788 | -0.05 | 9.95 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1592.2788 | 2.7407 | 10.08 | 6 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4020.3897 | -251.703 | 11.28 | 6 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4020.3897 | 242.5257 | 11.22 | 6 |
| Bottom–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5609.2459 | -172.1593 | 12.04 | 6 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5609.2459 | 283.6434 | 12.58 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 819.2881 | -8.2028 | 11.78 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 819.2881 | 11.6815 | 12.43 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1579.3148 | -0.7592 | 9.91 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1322.0427 | 30.2817 | 9.68 | 6 |
| Bottom–Left | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6280.5462 | -1319.5969 | 9.72 | 6 |
| Botttom–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6280.5462 | 1426.9415 | 9.9 | 6 |
| Bottom–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3976.9381 | -227.3651 | 11.02 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3976.9381 | 204.6329 | 10.86 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 967.1909 | -15.2844 | 14.96 | 6 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 967.1909 | 8.9161 | 13.76 | 6 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4011.6301 | -248.3228 | 11.24 | 6 |
| Botttom–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4011.6301 | 246.2364 | 11.23 | 6 |
| Bottom–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5593.7233 | -183.8737 | 12.07 | 6 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5593.7233 | 286.7109 | 12.56 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 818.2453 | -10.6968 | 12.23 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 818.2453 | 8.1091 | 11.75 | 6 |
| Bottom–Left | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 2868.5746 | -344.8293 | 9.18 | 6 |
| Botttom–Right | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 2868.5746 | 336.7767 | 9.12 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.392 | 203] 1.5 [DL + RSY] | 41110.4071 | -9601.5639 | -95.2788 |
| Bottom | 0.42 | 202] 1.5 [DL + RSX] | 38354.8974 | -49.7674 | -39508.6119 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 364.4506 | 16.5064 | 60.9848 | 20.3633 | 78.1025 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 2096.456 | 264.1134 | 218.903 | 407.2613 | 753.6961 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5066.7512 | 1363.7962 | -371.8285 | 744.0767 | 1350.3376 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 861.6499 | 29.0131 | -28.4994 | 53.0289 | 168.5071 |
| Top | Leg 5 | 531.01 | 206] [0.9 DL + 1.5 RSX] | 537.6946 | 151.9797 | 601.7085 | 279.7784 | 601.7085 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1513.1418 | 184.9398 | 304.5055 | 384.6252 | 745.4947 |
| Top | Leg 7 | 954.91 | 202] 1.5 [DL + RSX] | 196.175 | 8.4546 | -130.6343 | 20.3633 | 130.6343 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 832.9208 | 25.1854 | 28.0214 | 53.0289 | 168.5071 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5060.4756 | 1375.7996 | -399.2515 | 744.0767 | 1350.3376 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1731.2207 | 169.8358 | -206.7836 | 350.2606 | 653.391 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 349.7826 | 16.0279 | 61.4131 | 20.3633 | 78.1025 |
| Top | Leg 12 | 538.62 | 206] [0.9 DL + 1.5 RSX] | 489.2536 | 155.7442 | -603.4601 | 276.9178 | 603.4601 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1408.4849 | 183.7084 | 304.553 | 378.4448 | 739.3143 |
| Top | Leg 14 | 968.66 | 202] 1.5 [DL + RSX] | 175.5417 | 8.4932 | 132.2227 | 20.3633 | 132.2227 |
| Top | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1709.8618 | 129.9324 | -1316.7143 | 348.9992 | 652.1297 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 58.1456 | 8.4823 | 52.0434 | 20.3633 | 78.1025 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1961.3425 | 400.2628 | 209.5225 | 399.2823 | 745.7171 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5174.7428 | 1676.495 | -420.9934 | 744.0767 | 1350.3376 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 844.8696 | 37.4999 | 29.7276 | 53.0289 | 168.5071 |
| Bottom | Leg 5 | 591.41 | 206] [0.9 DL + 1.5 RSX] | 378.0695 | 294.2701 | -628.8982 | 270.352 | 628.8982 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 885.3361 | 275.6996 | 299.7118 | 347.5509 | 708.4205 |
| Bottom | Leg 7 | 768.5 | 202] 1.5 [DL + RSX] | 217.1696 | 12.0224 | -109.108 | 20.3633 | 109.108 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 818.3183 | 34.3923 | -28.878 | 53.0289 | 168.5071 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5193.2159 | 1737.5577 | -432.8581 | 744.0767 | 1350.3376 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1553.6955 | 241.0634 | -182.6498 | 339.777 | 642.9075 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 49.7792 | 7.9467 | 52.8127 | 20.3633 | 78.1025 |
| Bottom | Leg 12 | 606.1 | 206] [0.9 DL + 1.5 RSX] | 328.299 | 297.5336 | 634.8675 | 267.4128 | 634.8675 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 776.6846 | 278.1399 | 298.6241 | 341.1346 | 702.0042 |
| Bottom | Leg 14 | 792.65 | 202] 1.5 [DL + RSX] | 199.609 | 8.9375 | 111.8974 | 20.3633 | 111.8974 |
| Bottom | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1756.0421 | 402.0606 | 1433.2396 | 351.7264 | 654.8568 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 819.3541 | -9.6648 | 12.05 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 819.3541 | 16.5064 | 13.34 | 6 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4619.3109 | -226.2202 | 10.8 | 6 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4619.3109 | 264.1134 | 11 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6347.4085 | -1270.7647 | 9.72 | 6 |
| Top–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6347.4085 | 1363.7962 | 9.88 | 6 |
| Top–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1581.5853 | -0.148 | 9.89 | 6 |
| Top–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1581.5853 | 3.5506 | 10.05 | 6 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 4044.6323 | -162.5519 | 10.74 | 6 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 4044.6323 | 149.3367 | 10.65 | 6 |
| Top–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5419.1141 | -186.8516 | 11.74 | 6 |
| Top–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5419.1141 | 184.9398 | 11.73 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 932.4786 | -9.3015 | 13.4 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 932.4786 | 8.4546 | 13.24 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1571.7737 | -1.2196 | 9.88 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1390.9967 | 25.1854 | 9.87 | 6 |
| Top–Left | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6332.7523 | -1187.3309 | 9.56 | 6 |
| Top–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6332.7523 | 1375.7996 | 9.88 | 6 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 4047.2682 | -172.9545 | 10.81 | 6 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 4047.2682 | 169.8358 | 10.79 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 811.3881 | -9.2973 | 11.89 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 811.3881 | 16.0279 | 13.15 | 6 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 4036.5657 | -155.9566 | 10.67 | 6 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 4036.5657 | 155.6911 | 10.67 | 6 |
| Top–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5394.3867 | -181.6127 | 11.66 | 6 |
| Top–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5394.3867 | 183.7084 | 11.67 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 933.2253 | -8.4397 | 13.25 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 933.2253 | 8.4932 | 13.26 | 6 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2921.7673 | -6.3538 | 7 | 6 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2921.7673 | 2.1087 | 6.97 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1058.827 | -13.5813 | 15.78 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1058.827 | 8.4823 | 14.83 | 6 |
| Bottom–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4829.9716 | -367.1422 | 11.97 | 6 |
| Botttom–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4829.9716 | 400.2628 | 12.15 | 6 |
| Bottom–Left | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 7325.1044 | -34.9526 | 8.78 | 6 |
| Botttom–Right | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 7325.1044 | 115.3504 | 8.92 | 6 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1718.6401 | -0.0735 | 10.74 | 6 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1718.6401 | 2.9745 | 10.88 | 6 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4339.0714 | -303.3489 | 12.39 | 6 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4339.0714 | 292.0004 | 12.32 | 6 |
| Bottom–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 6123.5197 | -172.8439 | 13.08 | 6 |
| Botttom–Right | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 6123.5197 | 275.6996 | 13.57 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 902.533 | -9.0929 | 12.99 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 902.533 | 12.0224 | 13.54 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1704.6818 | -0.7702 | 10.69 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1400.3028 | 34.3923 | 10.36 | 6 |
| Bottom–Left | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 7337.9627 | -71.7286 | 8.86 | 6 |
| Botttom–Right | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 7337.9627 | 190.5771 | 9.06 | 6 |
| Bottom–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4299.437 | -264.2493 | 12.03 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4299.437 | 241.0634 | 11.88 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1046.878 | -13.2815 | 15.58 | 6 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1046.878 | 7.9467 | 14.58 | 6 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4333.1977 | -298.0274 | 12.34 | 6 |
| Botttom–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4333.1977 | 297.4101 | 12.34 | 6 |
| Bottom–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 6110.2836 | -183.8494 | 13.1 | 6 |
| Botttom–Right | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 6110.2836 | 278.1399 | 13.56 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 902.6137 | -11.0942 | 13.36 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 902.6137 | 8.9375 | 12.96 | 6 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3014.1567 | -9.2078 | 7.24 | 6 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3014.1567 | 1.3598 | 7.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.412 | 202] 1.5 [DL + RSX] | 38832.9113 | -40.235 | -36332.5149 |
| Bottom | 0.461 | 202] 1.5 [DL + RSX] | 39500.5891 | 788.1124 | -47594.5148 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 318.1985 | 13.9485 | 56.2556 | 20.2023 | 77.9414 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1940.1771 | 297.4042 | 253.8201 | 398.0324 | 744.4672 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5169.1486 | 1650.4698 | -418.5217 | 744.0767 | 1350.3376 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 851.3956 | 27.2643 | -29.2129 | 52.1521 | 167.6304 |
| Top | Leg 5 | 670.48 | 206] [0.9 DL + 1.5 RSX] | 353.9775 | 168.8165 | 675.4143 | 268.9292 | 675.4143 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1179.8039 | 178.0837 | 322.2691 | 364.9403 | 725.8099 |
| Top | Leg 7 | 791.64 | 202] 1.5 [DL + RSX] | 146.2123 | 8.2077 | -111.6199 | 20.2023 | 111.6199 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 821.4503 | 23.4076 | 28.6815 | 52.1521 | 167.6304 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5173.5642 | 1667.5838 | -441.8522 | 744.0767 | 1350.3376 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1583.806 | 192.9489 | -239.6558 | 341.5552 | 644.6856 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 302.6625 | 13.5442 | 56.3906 | 20.2023 | 77.9414 |
| Top | Leg 12 | 677.05 | 206] [0.9 DL + 1.5 RSX] | 303.2716 | 173.2051 | -676.4048 | 265.9349 | 676.4048 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1071.2351 | 175.0427 | 323.6541 | 358.5289 | 719.3985 |
| Top | Leg 14 | 803.85 | 202] 1.5 [DL + RSX] | 125.7258 | 7.5592 | 113.0296 | 20.2023 | 113.0296 |
| Top | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1759.5073 | 137.1334 | 1445.5993 | 351.931 | 655.0614 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 4.6109 | 6.9766 | -50.9996 | 20.2023 | 77.9414 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1719.1559 | 497.9621 | 258.1202 | 384.9803 | 731.4151 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5259.8899 | 2090.8819 | -472.9157 | 744.0767 | 1350.3376 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 843.214 | 41.3963 | 29.249 | 52.1521 | 167.6304 |
| Bottom | Leg 5 | 748.95 | 206] [0.9 DL + 1.5 RSX] | 127.4154 | 369.118 | -709.6061 | 255.5499 | 709.6061 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 441.4279 | 271.037 | 317.5923 | 321.3365 | 682.206 |
| Bottom | Leg 7 | 559.75 | 202] 1.5 [DL + RSX] | 152.2318 | 13.123 | -84.8411 | 20.2023 | 84.8411 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 814.8033 | 37.4842 | -28.3764 | 52.1521 | 167.6304 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5287.2363 | 2154.1264 | -477.4665 | 744.0767 | 1350.3376 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1311.0648 | 299.1597 | -228.6625 | 325.4488 | 628.5792 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -2.4254 | 6.6028 | -50.5365 | 20.2023 | 77.9414 |
| Bottom | Leg 12 | 760.5 | 206] [0.9 DL + 1.5 RSX] | 76.2037 | 376.8823 | 713.5855 | 252.5257 | 713.5855 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 332.7219 | 276.6141 | 318.1198 | 314.917 | 675.7866 |
| Bottom | Leg 14 | 578.01 | 202] 1.5 [DL + RSX] | 132.8256 | 10.2913 | 86.9494 | 20.2023 | 86.9494 |
| Bottom | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2830.6314 | 379.3305 | 1209.7909 | 372.0383 | 675.1688 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 893.7075 | -8.6494 | 12.79 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 893.7075 | 13.9485 | 13.79 | 6 |
| Top–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4976.0152 | -256.6965 | 11.7 | 6 |
| Top–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4976.0152 | 297.4042 | 11.92 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 7336.9796 | -30.1348 | 8.79 | 6 |
| Top–Right | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 7336.9796 | 127.2245 | 8.95 | 6 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1456.6073 | -23.9471 | 10.23 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1713.7374 | 3.2395 | 10.86 | 6 |
| Top–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4365.5658 | -180.5402 | 11.62 | 6 |
| Top–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4365.5658 | 165.8855 | 11.52 | 6 |
| Top–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5957.1718 | -165.3855 | 12.71 | 6 |
| Top–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5957.1718 | 178.0837 | 12.77 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1017.113 | -8.3213 | 14.27 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1017.113 | 8.2077 | 14.25 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1702.7857 | -1.3806 | 10.71 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1470.4885 | 23.4076 | 10.29 | 6 |
| Top–Left | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6562.8711 | -1473.8786 | 10.32 | 6 |
| Top–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 7423.6856 | 169.6191 | 9.13 | 6 |
| Top–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4370.4894 | -200.1035 | 11.77 | 6 |
| Top–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4370.4894 | 192.9489 | 11.72 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 886.3245 | -8.3838 | 12.65 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 886.3245 | 13.5442 | 13.62 | 6 |
| Top–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4360.4771 | -172.745 | 11.56 | 6 |
| Top–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4360.4771 | 173.3201 | 11.56 | 6 |
| Top–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5936.6295 | -160.8186 | 12.65 | 6 |
| Top–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5936.6295 | 175.0427 | 12.71 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1018.9143 | -8.1993 | 14.27 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1018.9143 | 7.5592 | 14.15 | 6 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3047.2284 | -6.6153 | 7.3 | 6 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3047.2284 | 2.496 | 7.27 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1155.1998 | -11.1854 | 16.54 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1155.1998 | 6.9766 | 15.75 | 6 |
| Bottom–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 5284.2583 | -455.531 | 13.38 | 6 |
| Botttom–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 5284.2583 | 497.9621 | 13.6 | 6 |
| Bottom–Left | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 7738.7329 | -82.5441 | 9.35 | 6 |
| Botttom–Right | Leg 3 | 900 | 202] 1.5 [DL + RSX] | 6815.5263 | 2090.8819 | 11.67 | 6 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1461.476 | -37.5698 | 10.9 | 6 |
| Botttom–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1875.1988 | 3.2658 | 11.87 | 6 |
| Bottom–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4719.795 | -384.3516 | 13.85 | 6 |
| Botttom–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4719.795 | 365.3096 | 13.72 | 6 |
| Bottom–Left | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 6788.1849 | -172.6786 | 14.41 | 6 |
| Botttom–Right | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6788.1849 | 271.037 | 14.88 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1004.1028 | -10.4968 | 14.52 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1004.1028 | 13.123 | 15.01 | 6 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1860.5385 | -0.8991 | 11.67 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1476.2209 | 37.4842 | 10.98 | 6 |
| Bottom–Left | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 7759.3709 | -58.8984 | 9.34 | 6 |
| Botttom–Right | Leg 9 | 900 | 202] 1.5 [DL + RSX] | 6744.7673 | 2154.1264 | 11.69 | 6 |
| Bottom–Left | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4727.4516 | -328.2601 | 13.49 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4727.4516 | 299.1597 | 13.29 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1145.1254 | -11.0048 | 16.38 | 6 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1145.1254 | 6.6028 | 15.55 | 6 |
| Bottom–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4716.1014 | -370.9706 | 13.75 | 6 |
| Botttom–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4716.1014 | 378.3602 | 13.8 | 6 |
| Bottom–Left | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 6779.7286 | -180.9913 | 14.43 | 6 |
| Botttom–Right | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6779.7286 | 276.6141 | 14.89 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1003.9047 | -12.3385 | 14.86 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1003.9047 | 10.2913 | 14.48 | 6 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3162.9851 | -9.8274 | 7.6 | 6 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3162.9851 | 2.5451 | 7.55 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.453 | 202] 1.5 [DL + RSX] | 39936.4594 | 747.9189 | -44919.6282 |
| Bottom | 0.53 | 202] 1.5 [DL + RSX] | 40799.3046 | 841.6362 | -61050.8632 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 234.2395 | 9.0707 | 56.0438 | 19.0953 | 76.8345 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1676.0667 | 368.676 | 325.4332 | 347.037 | 693.4718 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5253.8837 | 2044.1955 | -451.8676 | 744.0767 | 1350.3376 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 848.4917 | 24.9944 | -30.2934 | 46.3953 | 161.8736 |
| Top | Leg 5 | 824.27 | 202] 1.5 [DL + RSX] | 1313.4317 | 205.3487 | 748.1668 | 248.447 | 748.1668 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 672.7585 | 161.8914 | -313.3194 | 334.9974 | 695.867 |
| Top | Leg 7 | 679.25 | 202] 1.5 [DL + RSX] | 87.3088 | 6.4114 | -97.5337 | 19.0953 | 97.5337 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 817.4106 | 19.8333 | 29.5085 | 46.3953 | 161.8736 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5271.7246 | 2074.8843 | -471.7749 | 744.0767 | 1350.3376 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1329.8604 | 236.8598 | -303.6114 | 248.447 | 551.5774 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 219.5799 | 8.3978 | 56.2641 | 19.0953 | 76.8345 |
| Top | Leg 12 | 825.87 | 202] 1.5 [DL + RSX] | 1248.1744 | 221.5917 | -749.1418 | 248.447 | 749.1418 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 560.2463 | 157.7822 | -316.6238 | 328.3531 | 689.2227 |
| Top | Leg 14 | 687.62 | 202] 1.5 [DL + RSX] | 65.9883 | 4.4129 | 98.5008 | 19.0953 | 98.5008 |
| Top | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2836.7841 | 127.9298 | 1211.7997 | 248.447 | 551.5774 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -178.7209 | 4.2346 | -50.7382 | 19.0953 | 76.8345 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1242.366 | 855.9487 | 377.2181 | 347.037 | 693.4718 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5353.0437 | 2772.2073 | -534.2578 | 744.0767 | 1350.3376 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 855.5961 | 51.5193 | 24.8987 | 46.3953 | 161.8736 |
| Bottom | Leg 5 | 886.28 | 202] 1.5 [DL + RSX] | 996.6367 | 522.3708 | -785.7609 | 248.447 | 785.7609 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -374.5041 | 213.2286 | 314.818 | 295.2685 | 656.1381 |
| Bottom | Leg 7 | 500 | 202] 1.5 [DL + RSX] | 27.9782 | 11.8093 | 58.335 | 19.0953 | 76.8345 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 823.6167 | 46.6328 | -24.0791 | 46.3953 | 161.8736 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5391.6612 | 2839.3074 | -526.1147 | 744.0767 | 1350.3376 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 821.7789 | 523.5905 | 337.3986 | 248.447 | 551.5774 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -187.6047 | 4.0213 | -50.1774 | 19.0953 | 76.8345 |
| Bottom | Leg 12 | 892.49 | 202] 1.5 [DL + RSX] | 934.5619 | 535.9977 | 789.5258 | 248.447 | 789.5258 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -485.7252 | 220.9336 | 315.8411 | 295.2685 | 656.1381 |
| Bottom | Leg 14 | 500 | 202] 1.5 [DL + RSX] | 6.1153 | 11.0251 | -59.6481 | 19.0953 | 76.8345 |
| Bottom | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1863.4964 | 508.5857 | 1370.0253 | 248.447 | 551.5774 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1005.458 | -5.7223 | 13.64 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1005.458 | 9.0707 | 14.27 | 6 |
| Top–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 5442.0293 | -315.4057 | 12.98 | 6 |
| Top–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 5442.0293 | 368.676 | 13.26 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 7744.0612 | -61.8124 | 9.32 | 6 |
| Top–Right | Leg 3 | 900 | 202] 1.5 [DL + RSX] | 6822.173 | 2044.1955 | 11.6 | 6 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1531.0911 | -20.327 | 10.52 | 6 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1882.0389 | 3.2125 | 11.91 | 6 |
| Top–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4747.541 | -228.0603 | 12.86 | 6 |
| Top–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4747.541 | 205.3487 | 12.7 | 6 |
| Top–Left | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 6670.6318 | -126.1705 | 13.95 | 6 |
| Top–Right | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 6670.6318 | 161.8914 | 14.12 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1113.8503 | -4.747 | 14.81 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1113.8503 | 6.4114 | 15.13 | 6 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1870.0199 | -2.0788 | 11.79 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1546.3431 | 19.8333 | 10.59 | 6 |
| Top–Left | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 7847.2019 | -43.699 | 9.42 | 6 |
| Top–Right | Leg 9 | 900 | 202] 1.5 [DL + RSX] | 6790.5541 | 2074.8843 | 11.61 | 6 |
| Top–Left | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4801.1291 | -253.7693 | 13.16 | 6 |
| Top–Right | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4801.1291 | 236.8598 | 13.04 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 998.0915 | -5.6708 | 13.54 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 998.0915 | 8.3978 | 14.05 | 6 |
| Top–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4744.7673 | -211.4193 | 12.74 | 6 |
| Top–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4744.7673 | 221.5917 | 12.8 | 6 |
| Top–Left | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 6653.0667 | -120.7365 | 13.89 | 6 |
| Top–Right | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 6653.0667 | 157.7822 | 14.06 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1115.3273 | -6.5077 | 15.16 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1115.3273 | 4.4129 | 14.77 | 6 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3196.6914 | -6.8697 | 7.66 | 6 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3196.6914 | 3.3304 | 7.63 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1380.4323 | -6.231 | 18.42 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1380.4323 | 4.2346 | 18.05 | 6 |
| Bottom–Left | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5990.0014 | -782.9997 | 16.56 | 6 |
| Botttom–Right | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5990.0014 | 855.9487 | 16.94 | 6 |
| Bottom–Left | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 7110.313 | -2660.9848 | 12.99 | 6 |
| Botttom–Right | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 7110.313 | 2772.2073 | 13.18 | 6 |
| Bottom–Left | Leg 4 | 200 | 207] [0.9 DL + 1.5 RSY] | 1641.4253 | -0.0322 | 10.26 | 6 |
| Botttom–Right | Leg 4 | 300 | 207] [0.9 DL + 1.5 RSY] | 2119.0876 | 4.0421 | 13.43 | 6 |
| Bottom–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 5247.627 | -541.7524 | 16.18 | 6 |
| Botttom–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 5247.627 | 522.3708 | 16.05 | 6 |
| Bottom–Left | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 7849.4266 | -132.7417 | 16.34 | 6 |
| Botttom–Right | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 7849.4266 | 213.2286 | 16.72 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1166.2208 | -11.1607 | 16.67 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1166.2208 | 11.8093 | 16.79 | 6 |
| Bottom–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2105.4819 | -1.3046 | 13.22 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1550.7464 | 46.6328 | 11.88 | 6 |
| Bottom–Left | Leg 9 | 900 | 202] 1.5 [DL + RSX] | 8076.963 | -112.9004 | 9.81 | 6 |
| Botttom–Right | Leg 9 | 900 | 202] 1.5 [DL + RSX] | 7034.7125 | 2839.3074 | 13.2 | 6 |
| Bottom–Left | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5421.5433 | -567.0088 | 16.77 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5421.5433 | 523.5905 | 16.47 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1368.329 | -6.2539 | 18.28 | 6 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1368.329 | 4.0213 | 17.86 | 6 |
| Bottom–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 5242.6352 | -527.2365 | 16.07 | 6 |
| Botttom–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 5242.6352 | 535.9977 | 16.13 | 6 |
| Bottom–Left | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 7840.8164 | -141.9484 | 16.36 | 6 |
| Botttom–Right | Leg 13 | 900 | 202] 1.5 [DL + RSX] | 7840.8164 | 220.9336 | 16.74 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1168.4607 | -11.3061 | 16.73 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1168.4607 | 11.0251 | 16.67 | 6 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3382.2611 | -10.932 | 8.13 | 6 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3382.2611 | 4.0156 | 8.08 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.525 | 202] 1.5 [DL + RSX] | 41176.0938 | 773.0387 | -59427.3083 |
| Bottom | 0.594 | 202] 1.5 [DL + RSX] | 42001.9599 | -348.0476 | -73297.3811 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -33.8079 | 3.2367 | 44.8424 | 19.2605 | 76.9996 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1203.876 | 720.0312 | -358.843 | 354.5511 | 700.9859 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5347.4578 | 2704.5578 | -484.6176 | 744.0767 | 1350.3376 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 870.4501 | 11.9047 | -31.6672 | 47.2253 | 162.7035 |
| Top | Leg 5 | 746.61 | 206] [0.9 DL + 1.5 RSX] | -274.7521 | 356.115 | 700.6656 | 248.0256 | 700.6656 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -255.1781 | 187.8248 | -223.8527 | 295.2685 | 656.1381 |
| Top | Leg 7 | 500 | 202] 1.5 [DL + RSX] | -16.5895 | 3.8925 | -56.1925 | 19.2605 | 76.9996 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 837.0792 | 6.5675 | 30.6095 | 47.2253 | 162.7035 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5386.8161 | 2766.4379 | -494.6096 | 744.0767 | 1350.3376 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 822.7796 | 451.6657 | -302.8046 | 263.9749 | 567.1053 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -45.1111 | 2.9456 | 41.4292 | 19.2605 | 76.9996 |
| Top | Leg 12 | 747.23 | 206] [0.9 DL + 1.5 RSX] | -323.5927 | 365.8972 | -701.0421 | 248.0256 | 701.0421 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -364.5625 | 184.0563 | -227.2024 | 295.2685 | 656.1381 |
| Top | Leg 14 | 500 | 202] 1.5 [DL + RSX] | -39.1066 | 1.7137 | 57.1237 | 19.2605 | 76.9996 |
| Top | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1867.7487 | 214.4645 | -1346.0385 | 263.9749 | 567.1053 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -384.4121 | 2.0839 | -57.0703 | 19.2605 | 76.9996 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 980.9592 | 1387.1689 | -396.043 | 341.3871 | 687.8218 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 5486.4548 | 3385.7833 | -517.0423 | 744.0767 | 1350.3376 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 933.7326 | 67.4264 | 14.0341 | 47.2253 | 162.7035 |
| Bottom | Leg 5 | 665.21 | 206] [0.9 DL + 1.5 RSX] | -551.1071 | 771.2748 | -651.3161 | 248.0256 | 651.3161 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -1148.9597 | 303.6347 | 216.5114 | 295.2685 | 656.1381 |
| Bottom | Leg 7 | 500 | 202] 1.5 [DL + RSX] | -30.8695 | 13.504 | 35.2843 | 19.2605 | 76.9996 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 893.5461 | 64.6211 | -14.0503 | 47.2253 | 162.7035 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 5558.3601 | 3527.8504 | -494.6718 | 744.0767 | 1350.3376 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 501.9316 | 892.9726 | 397.2747 | 263.9749 | 567.1053 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -395.1154 | 2.0591 | -56.2079 | 19.2605 | 76.9996 |
| Bottom | Leg 12 | 667.53 | 206] [0.9 DL + 1.5 RSX] | -595.0226 | 793.2853 | 652.723 | 248.0256 | 652.723 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -1259.3534 | 297.8479 | 217.1847 | 295.2685 | 656.1381 |
| Bottom | Leg 14 | 500 | 202] 1.5 [DL + RSX] | -54.3409 | 13.4779 | -35.507 | 19.2605 | 76.9996 |
| Bottom | Leg 15 | 1072.18 | 202] 1.5 [DL + RSX] | 3098.1547 | 679.0786 | -913.9969 | 263.9749 | 913.9969 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 0

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1288.3191 | -3.1033 | 16.69 | 6 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1288.3191 | 3.2367 | 16.71 | 6 |
| Top–Left | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 6140.0683 | -634.1842 | 16.09 | 6 |
| Top–Right | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 6140.0683 | 720.0312 | 16.54 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 900 | 202] 1.5 [DL + RSX] | 8044.7442 | -116.1529 | 9.77 | 6 |
| Top–Right | Leg 3 | 900 | 202] 1.5 [DL + RSX] | 7118.171 | 2704.5578 | 13.07 | 6 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1590.3567 | -6.7072 | 10.25 | 6 |
| Top–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 2146.2925 | 3.4377 | 13.58 | 6 |
| Top–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 5271.4538 | -374.0503 | 15.1 | 6 |
| Top–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 5271.4538 | 351.6312 | 14.94 | 6 |
| Top–Left | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 7813.331 | -131.7749 | 16.26 | 6 |
| Top–Right | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 7813.331 | 187.8248 | 16.53 | 6 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1257.5512 | -1.8349 | 16.06 | 6 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1257.5512 | 3.8925 | 16.45 | 6 |
| Top–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2132.2759 | -1.72 | 13.41 | 6 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1608.2599 | 6.5675 | 10.36 | 6 |
| Top–Left | Leg 9 | 900 | 202] 1.5 [DL + RSX] | 8142.8476 | -75.6198 | 9.82 | 6 |
| Top–Right | Leg 9 | 900 | 202] 1.5 [DL + RSX] | 7071.1824 | 2766.4379 | 13.12 | 6 |
| Top–Left | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5491.3181 | -498.2847 | 16.46 | 6 |
| Top–Right | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5491.3181 | 451.6657 | 16.15 | 6 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1279.3132 | -3.1671 | 16.59 | 6 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1279.3132 | 2.9456 | 16.54 | 6 |
| Top–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 5266.5729 | -357.1746 | 14.97 | 6 |
| Top–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 5266.5729 | 368.0779 | 15.04 | 6 |
| Top–Left | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 7802.641 | -124.3932 | 16.2 | 6 |
| Top–Right | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 7802.641 | 184.0563 | 16.49 | 6 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1259.6333 | -4.0933 | 16.51 | 6 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1259.6333 | 1.7137 | 16.07 | 6 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3408.7616 | -7.2262 | 8.17 | 6 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3408.7616 | 4.6988 | 8.15 | 6 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1672.2949 | -1.5225 | 21.19 | 6 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1672.2949 | 2.0839 | 21.29 | 6 |
| Bottom–Left | Leg 2 | 900 | 202] 1.5 [DL + RSX] | 6532.7648 | -1274.5379 | 20.25 | 6 |
| Botttom–Right | Leg 2 | 900 | 202] 1.5 [DL + RSX] | 6532.7648 | 1387.1689 | 20.83 | 6 |
| Bottom–Left | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7315.4865 | -3323.9103 | 14.36 | 6 |
| Botttom–Right | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7315.4865 | 3385.7833 | 14.47 | 6 |
| Bottom–Left | Leg 4 | 300 | 203] 1.5 [DL + RSY] | 2478.1079 | -0.2115 | 15.5 | 6 |
| Botttom–Right | Leg 4 | 300 | 203] 1.5 [DL + RSY] | 2478.1079 | 2.6004 | 15.61 | 6 |
| Bottom–Left | Leg 5 | 700 | 202] 1.5 [DL + RSX] | 5550.5586 | -804.713 | 18.69 | 6 |
| Botttom–Right | Leg 5 | 700 | 202] 1.5 [DL + RSX] | 5550.5586 | 762.9153 | 18.41 | 6 |
| Bottom–Left | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 8855.992 | -163.2485 | 18.5 | 6 |
| Botttom–Right | Leg 6 | 1000 | 202] 1.5 [DL + RSX] | 8855.992 | 303.6347 | 19.17 | 6 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1295.9939 | -13.5116 | 18.73 | 6 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1295.9939 | 13.504 | 18.73 | 6 |
| Bottom–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2461.3235 | -0.5212 | 15.41 | 6 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1943.4094 | 0.1111 | 12.15 | 6 |
| Bottom–Left | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 7242.0687 | -3303.4776 | 14.24 | 6 |
| Botttom–Right | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 7242.0687 | 3527.8504 | 14.62 | 6 |
| Bottom–Left | Leg 10 | 800 | 202] 1.5 [DL + RSX] | 5957.8537 | -943.501 | 20.6 | 6 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 800 | 202] 1.5 [DL + RSX] | 5957.8537 | 892.9726 | 20.26 | 6 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1657.1494 | -1.6704 | 21.03 | 6 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1657.1494 | 2.0591 | 21.1 | 6 |
| Bottom–Left | Leg 12 | 700 | 202] 1.5 [DL + RSX] | 5541.1931 | -768.308 | 18.42 | 6 |
| Botttom–Right | Leg 12 | 700 | 202] 1.5 [DL + RSX] | 5541.1931 | 799.5297 | 18.63 | 6 |
| Bottom–Left | Leg 13 | 900 | 202] 1.5 [DL + RSX] | 8846.6333 | -160.7946 | 18.47 | 6 |
| Botttom–Right | Leg 13 | 1000 | 202] 1.5 [DL + RSX] | 8846.6333 | 297.8479 | 19.12 | 6 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1301.4635 | -13.5521 | 18.81 | 6 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1301.4635 | 13.4779 | 18.8 | 6 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3456.6486 | -13.972 | 8.33 | 6 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3456.6486 | 7.8721 | 8.28 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1835 | 0.0044 | 0.0024 | 203] 1.5 [DL + RSY] | 67.9612 | 58.4546 | 88.8968 | 420000 |
| Bottom | 2080 | 0.005 | 0.0024 | 203] 1.5 [DL + RSY] | 136.7684 | 67.4398 | -213.811 | 420000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 25.6675 | 308.7794 | -136.0751 | 116.542 | 419.6724 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 94.4747 | -47.1106 | -141.2229 | 126.4524 | 429.5829 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 373.1928 | -227.9541 | 2.44 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 373.1928 | 146.0135 | 1.88 | 6 |
| Bottom–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 428.2386 | -54.8841 | 1.39 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 303.1486 | 31.9147 | 0.94 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 1710 | 0.0041 | 0.0024 | 207] [0.9 DL + 1.5 RSY] | 229.2185 | -63.4892 | 142.5742 | 420000 |
| Bottom | 1229 | 0.0029 | 0.0024 | 207] [0.9 DL + 1.5 RSY] | 257.0878 | -50.9645 | -216.6712 | 420000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 496.623 | 356.9452 | -319.4358 | 125.0522 | 428.1826 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 543.0718 | 107.3354 | -321.6757 | 110.0393 | 413.1697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 689.9682 | -20.0466 | 1.78 | 6 |
| Top–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 1006.3943 | 326.1253 | 4.61 | 6 |
| Bottom–Left | Leg 1 | 200 | 204] 1.2 [DL + LL + RSX] | 1043.5534 | -621.6614 | 6.71 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1043.5534 | 41.9255 | 2.77 | 6 |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Concrete Frame Design

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C1 | 32 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.846 |
| Bottom | 19636 | 4.01 | 0.85 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9201.2391 | 288.6735 | 0.5225 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 9245.5465 | -290.0636 | -3.5677 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6527 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6527 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.383 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.383 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C2 | 33 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.788 |
| Bottom | 15709 | 3.21 | 0.793 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7602.4496 | -238.5142 | -0.4415 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 7646.757 | -239.9043 | -0.0504 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1645 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1645 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8871 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8871 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C3 | 34 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.844 |
| Bottom | 19636 | 4.01 | 0.848 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9186.1875 | 288.2013 | -2.1814 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 9230.4949 | -289.5914 | 3.2798 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2333 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2333 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5072 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.5072 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C4 | 35 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.776 |
| Bottom | 15709 | 3.21 | 0.781 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7491.2185 | -235.0245 | -0.3902 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 7535.5259 | -236.4146 | -0.1885 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.0872 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.0872 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8141 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8141 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C5 | 36 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.848 |
| Bottom | 19636 | 4.01 | 0.851 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9223.8117 | -3.5791 | -289.3817 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 9268.1191 | 290.7718 | 4.9345 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0402 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0402 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9734 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9734 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C6 | 37 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.797 |
| Bottom | 15709 | 3.21 | 0.801 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7688.3172 | -0.2735 | 241.2081 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 7732.6246 | 242.5982 | -2.7197 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4452 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4452 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5049 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5049 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C7 | 38 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.845 |
| Bottom | 19636 | 4.01 | 0.849 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9185.1159 | -0.5088 | 288.1677 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 9229.4233 | 289.5578 | -1.335 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.557 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.557 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8177 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.8177 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C8 | 39 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.821 |
| Bottom | 15709 | 3.21 | 0.826 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7927.5547 | -248.7138 | -1.9976 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 7971.8621 | 250.1039 | 2.4453 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8238 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8238 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8161 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.8161 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C9 | 40 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.7 |
| Bottom | 13745 | 2.29 | 0.705 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7053.9928 | -197.794 | 3.578 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 7108.2468 | 199.3152 | 4.7856 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.476 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.476 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.4106 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.4106 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C10 | 41 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.715 |
| Bottom | 13745 | 2.29 | 0.72 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7202.9555 | 201.9709 | 2.0204 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 7257.2095 | -203.4922 | 3.1815 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.4651 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.4651 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.6953 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.6953 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C11 | 42 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.681 |
| Bottom | 13745 | 2.29 | 0.687 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6865.8299 | 192.5179 | 3.2004 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 6920.0839 | -194.0392 | 3.2557 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.0056 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.0056 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.6265 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.6265 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C12 | 43 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.684 |
| Bottom | 13745 | 2.29 | 0.689 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6886.1731 | 193.0883 | 1.8861 | 2412 | 201] 1.5 [DL + LL] |
| Bottom | 6940.4271 | 194.6096 | 1.2324 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.2784 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.2784 | 1608 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.2115 | 4020 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.2115 | 1608 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C1 | 231 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.798 |
| Bottom | 19636 | 4.01 | 0.801 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8670.7157 | 0.7963 | -275.1507 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8717.0071 | -276.6197 | 5.0476 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3812 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3812 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.215 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.215 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C2 | 232 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.78 |
| Bottom | 15709 | 3.21 | 0.785 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7526.62 | 238.8447 | -1.0252 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 7572.9113 | 240.3137 | -0.6866 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1645 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1645 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8871 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8871 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C3 | 233 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.792 |
| Bottom | 19636 | 4.01 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8605.259 | 0.9929 | 273.0736 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8651.5503 | -274.5425 | -3.9317 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6631 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6631 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1367 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1367 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C4 | 234 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.769 |
| Bottom | 15709 | 3.21 | 0.774 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7415.3888 | 235.315 | -0.6664 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 7461.6802 | 236.784 | -0.5105 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.0872 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.0872 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8141 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8141 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C5 | 235 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.789 |
| Bottom | 19636 | 4.01 | 0.791 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8571.6436 | -0.1584 | -272.0068 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8617.9349 | 10.3591 | 273.4758 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5987 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.5987 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0379 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0379 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C6 | 236 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.758 |
| Bottom | 15709 | 3.21 | 0.763 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7320.3246 | -232.2983 | -4.2948 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 7366.616 | 233.7673 | -5.0621 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3369 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.3369 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.996 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.996 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C7 | 237 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.802 |
| Bottom | 19636 | 4.01 | 0.806 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8722.5896 | -0.3193 | 276.7968 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 8768.8809 | 2.3171 | -278.2658 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5744 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.5744 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9111 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9111 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C8 | 238 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.778 |
| Bottom | 15709 | 3.21 | 0.782 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7507.5665 | -238.2401 | 0.4495 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 7553.8579 | 239.7091 | 5.2321 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8995 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8995 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1087 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1087 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C9 | 239 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.68 |
| Bottom | 13745 | 2.29 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6843.5347 | 194.3564 | 2.7025 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 6900.2179 | 195.9662 | 1.337 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6179 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6179 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.2357 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.2357 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C10 | 240 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.694 |
| Bottom | 13745 | 2.29 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6993.1352 | 198.605 | 3.4701 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 7049.8185 | 200.2148 | 2.0825 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6043 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6043 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.5029 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.5029 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C11 | 241 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.661 |
| Bottom | 13745 | 2.29 | 0.667 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6658.369 | 189.0977 | 3.167 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 6715.0523 | 190.7075 | 1.6396 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6721 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6721 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1192 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1192 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C12 | 242 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.663 |
| Bottom | 13745 | 2.29 | 0.669 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6681.7202 | -189.7609 | 3.7376 | 2520 | 201] 1.5 [DL + LL] |
| Bottom | 6738.4035 | -191.3707 | 2.0561 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.7112 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.7112 | 1680 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3025 | 4200 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.3025 | 1680 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C1 | 474 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.903 |
| Bottom | 14292 | 2.92 | 0.906 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8329.3083 | 248.491 | -0.3224 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8365.1289 | 5.9342 | 249.5597 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6159 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6159 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5034 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.5034 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C2 | 475 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.876 |
| Bottom | 11116 | 2.27 | 0.88 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7206.2056 | 214.9851 | -1.7286 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 7242.0263 | 0.62 | -216.0538 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9524 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9524 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3275 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.3275 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C3 | 476 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.896 |
| Bottom | 14292 | 2.92 | 0.899 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8261.8581 | 246.4788 | -1.1955 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8297.6787 | 5.8258 | -247.5474 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5582 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.5582 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2376 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2376 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C4 | 477 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.863 |
| Bottom | 11116 | 2.27 | 0.867 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7099.2448 | 211.7941 | 1.1805 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 7135.0655 | 3.614 | 212.8628 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7742 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7742 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9885 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9885 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C5 | 478 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.891 |
| Bottom | 14292 | 2.92 | 0.895 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8216.1982 | -245.1166 | -1.156 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8252.0189 | 246.1852 | 0.6802 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1178 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1178 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5509 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.5509 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C6 | 479 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.848 |
| Bottom | 11116 | 2.27 | 0.851 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6977.2803 | 208.1555 | 1.1973 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 7013.1009 | 7.0898 | -209.2242 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9073 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9073 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5161 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5161 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C7 | 480 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.911 |
| Bottom | 14292 | 2.92 | 0.915 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8398.62 | 0.0647 | -250.5588 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 8434.4407 | -0.6691 | -251.6275 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8412 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8412 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4805 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4805 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C8 | 481 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.872 |
| Bottom | 11116 | 2.27 | 0.876 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7171.7239 | -213.9564 | 0.2921 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 7207.5446 | 2.8956 | 215.0251 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3365 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3365 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6977 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6977 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C9 | 482 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.712 |
| Bottom | 11116 | 1.85 | 0.717 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6607.559 | 175.1003 | 3.817 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 6651.4211 | 176.2627 | 1.542 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2832 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2832 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.3247 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.3247 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C10 | 483 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.729 |
| Bottom | 11116 | 1.85 | 0.733 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6759.2574 | 179.1203 | 4.1406 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 6803.1195 | 180.2827 | 6.0027 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.8334 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.8334 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.108 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.108 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C11 | 484 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.695 |
| Bottom | 11116 | 1.85 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6443.5594 | 170.7543 | 3.6318 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 6487.4214 | -171.9167 | 1.6384 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.1342 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.1342 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.0127 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.0127 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C12 | 485 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.697 |
| Bottom | 11116 | 1.85 | 0.701 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6464.2849 | 171.3035 | 4.3573 | 1950 | 201] 1.5 [DL + LL] |
| Bottom | 6508.1469 | -172.4659 | 6.3612 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9135 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9135 | 1300 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.0115 | 3250 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.0115 | 1300 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C1 | 701 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.918 |
| Bottom | 12704 | 2.59 | 0.921 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8006.7475 | 237.2666 | -0.1628 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8041.466 | -4.0114 | 238.2954 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7224 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7224 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0116 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0116 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C2 | 702 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.868 |
| Bottom | 10322 | 2.11 | 0.872 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6928.6717 | 1.9063 | 205.3196 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6963.3902 | -206.3485 | 3.2766 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.8283 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.8283 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5221 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.5221 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C3 | 703 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.91 |
| Bottom | 12704 | 2.59 | 0.912 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7939.0554 | 235.2607 | -1.1951 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7973.7739 | -236.2895 | -5.6395 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.346 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.346 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1999 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1999 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C4 | 704 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.855 |
| Bottom | 10322 | 2.11 | 0.858 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6823.8635 | 1.5037 | -202.2138 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6858.582 | -203.2426 | -5.3678 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.0323 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.0323 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1467 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.1467 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C5 | 705 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.904 |
| Bottom | 12704 | 2.59 | 0.907 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7891.6156 | 233.8549 | 0.4587 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7926.3341 | 234.8837 | 6.4809 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3335 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3335 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0922 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0922 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C6 | 706 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.841 |
| Bottom | 10322 | 2.11 | 0.845 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6712.0284 | 1.6645 | 198.8998 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6746.7469 | 199.9286 | -1.3769 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0479 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0479 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6146 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6146 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C7 | 707 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.924 |
| Bottom | 12704 | 2.59 | 0.927 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8064.6548 | 238.9826 | -0.637 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 8099.3733 | 3.5467 | -240.0114 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.298 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.298 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7086 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7086 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C8 | 708 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.864 |
| Bottom | 10322 | 2.11 | 0.866 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6890.5337 | 0.7995 | -204.1895 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6925.2522 | 205.2183 | -6.0159 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6968 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6968 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6817 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.6817 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C9 | 709 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.707 |
| Bottom | 10322 | 1.72 | 0.712 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6386.7419 | 167.9713 | 4.3415 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6429.2543 | -169.0894 | 3.4602 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6309 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6309 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1545 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1545 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C10 | 710 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.724 |
| Bottom | 10322 | 1.72 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6541.3008 | 172.0362 | 3.4507 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6583.8133 | -173.1543 | 4.7405 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.5094 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.5094 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.1813 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.1813 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C11 | 711 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.688 |
| Bottom | 10322 | 1.72 | 0.693 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6220.8182 | 163.6075 | 4.1817 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6263.3307 | 164.7256 | 2.9625 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.8001 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.8001 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1154 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1154 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C12 | 712 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.692 |
| Bottom | 10322 | 1.72 | 0.696 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6247.8471 | 164.3184 | 3.3584 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6290.3596 | 165.4365 | 3.3686 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.1553 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.1553 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1968 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1968 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C1 | 928 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.817 |
| Bottom | 7940 | 1.62 | 0.822 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5913.6915 | 1.838 | -175.2424 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5948.41 | 0.9591 | 176.2712 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.0057 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.0057 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9763 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9763 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C2 | 929 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.705 |
| Bottom | 7940 | 1.62 | 0.707 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5106.2122 | 151.3141 | -3.4936 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5117.785 | -2.1469 | 151.657 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.5116 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.5116 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0925 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.0925 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C3 | 930 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.807 |
| Bottom | 7940 | 1.62 | 0.812 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5842.4658 | 173.1317 | 1.8683 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5877.1843 | -1.2091 | -174.1606 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.8492 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.8492 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.391 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.391 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C4 | 931 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.693 |
| Bottom | 7940 | 1.62 | 0.695 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5018.7102 | 148.7211 | 1.4857 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5030.283 | -1.9507 | -149.0641 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6348 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.6348 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8323 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8323 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C5 | 932 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.8 |
| Bottom | 7940 | 1.62 | 0.804 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5791.971 | 1.4211 | -171.6354 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5826.6895 | 4.3119 | 172.6642 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6701 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.6701 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1208 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.1208 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C6 | 933 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.687 |
| Bottom | 7940 | 1.62 | 0.688 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4970.1827 | 0.7656 | -147.2831 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5004.9012 | 148.3119 | 10.2371 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0702 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.0702 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4405 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.4405 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C7 | 934 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.82 |
| Bottom | 7940 | 1.62 | 0.822 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5931.331 | 0.9299 | 175.7651 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5966.0495 | 6.5747 | -176.7939 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.4233 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.4233 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5037 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5037 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C8 | 935 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.699 |
| Bottom | 7940 | 1.62 | 0.699 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5062.236 | -2.1361 | 150.0109 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5073.8088 | 150.3539 | -5.7751 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.2342 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.2342 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.1147 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.1147 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C9 | 936 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.582 |
| Bottom | 7940 | 1.32 | 0.586 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4822.588 | 126.8341 | 3.333 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4865.1004 | 127.9521 | 6.4183 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2339 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2339 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.7953 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.7953 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C10 | 937 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.605 |
| Bottom | 7940 | 1.32 | 0.611 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5019.6514 | 132.0168 | 3.8336 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5062.1639 | 133.1349 | -0.3039 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.5571 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.5571 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.2818 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.2818 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C11 | 938 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.559 |
| Bottom | 7940 | 1.32 | 0.562 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4629.2373 | -121.7489 | 2.9042 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4671.7498 | -122.867 | 9.337 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.9971 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.9971 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.896 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.896 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C12 | 939 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.569 |
| Bottom | 7940 | 1.32 | 0.575 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4718.515 | -124.0969 | 3.4252 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4761.0274 | -125.215 | 1.3205 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4827 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4827 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.4438 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.4438 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C1 | 1155 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.855 |
| Bottom | 7940 | 1.62 | 0.861 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6196.8274 | 4.3629 | 183.6327 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6231.5459 | -184.6615 | 0.9884 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7632 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7632 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0194 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.0194 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C2 | 1156 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.74 |
| Bottom | 7940 | 1.62 | 0.745 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5355.5504 | 1.5615 | 158.7028 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5390.2689 | -159.7316 | -1.0985 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9202 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9202 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0039 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.0039 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C3 | 1157 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.845 |
| Bottom | 7940 | 1.62 | 0.851 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6126.3427 | 5.3598 | -181.544 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6161.0612 | -182.5728 | -1.705 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0128 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0128 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7261 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7261 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C4 | 1158 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.727 |
| Bottom | 7940 | 1.62 | 0.733 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5265.3986 | 2.0547 | -156.0313 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5300.1171 | -157.0601 | -0.1073 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7856 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7856 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6792 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.6792 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C5 | 1159 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.839 |
| Bottom | 7940 | 1.62 | 0.845 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6076.1126 | -1.9896 | 180.0555 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6110.8311 | 181.0843 | 0.5072 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4807 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4807 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4995 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.4995 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C6 | 1160 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.719 |
| Bottom | 7940 | 1.62 | 0.723 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5208.0546 | 1.7884 | 154.332 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5242.7731 | 5.4567 | -155.3608 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1691 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1691 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6037 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6037 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C7 | 1161 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.859 |
| Bottom | 7940 | 1.62 | 0.863 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6216.9189 | 0.4643 | -184.228 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6251.6374 | 185.2569 | -4.1383 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9044 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9044 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6903 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6903 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C8 | 1162 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.734 |
| Bottom | 7940 | 1.62 | 0.738 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5310.2736 | 1.4948 | -157.3611 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5344.9921 | 158.3899 | -3.3711 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1623 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1623 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1259 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1259 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C9 | 1163 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.608 |
| Bottom | 7940 | 1.32 | 0.615 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5048.0595 | 132.764 | 6.0358 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5090.572 | -133.882 | 0.0251 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5311 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.5311 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.8184 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.8184 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C10 | 1164 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.632 |
| Bottom | 7940 | 1.32 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5236.5246 | 137.7206 | -0.3613 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5279.0371 | -138.8387 | 8.7123 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.4077 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.4077 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.0884 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.0884 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C11 | 1165 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.585 |
| Bottom | 7940 | 1.32 | 0.592 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4860.2102 | -127.8235 | 8.1198 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4902.7227 | 128.9416 | 0.1193 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.573 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.573 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.6734 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.6734 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C12 | 1166 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.596 |
| Bottom | 7940 | 1.32 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4938.6528 | -129.8866 | 1.7682 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4981.1652 | 131.0046 | 7.9193 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8807 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8807 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.7371 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.7371 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C1 | 1382 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.839 |
| Bottom | 9528 | 1.94 | 0.843 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6484.9049 | 1.1264 | -192.1693 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6519.6234 | -193.1982 | 2.7509 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4501 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4501 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.546 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.546 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C2 | 1383 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.748 |
| Bottom | 8734 | 1.78 | 0.754 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5608.2312 | 166.1906 | -2.9362 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5642.9497 | -167.2194 | -0.0461 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6842 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6842 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.798 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.798 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C3 | 1384 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.829 |
| Bottom | 9528 | 1.94 | 0.833 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6415.0721 | 2.0189 | 190.1 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6449.7906 | -191.1288 | -3.4607 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1095 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1095 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3882 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3882 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C4 | 1385 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.736 |
| Bottom | 8734 | 1.78 | 0.741 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5515.4669 | 163.4417 | 2.2594 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5550.1854 | -164.4705 | -1.1912 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7186 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7186 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3128 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.3128 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C5 | 1386 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.823 |
| Bottom | 9528 | 1.94 | 0.827 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6365.1177 | 1.144 | -188.6197 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6399.8362 | 189.6485 | 2.4583 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4209 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4209 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3021 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3021 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C6 | 1387 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.728 |
| Bottom | 8734 | 1.78 | 0.731 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5449.3336 | -1.0502 | -161.4819 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5484.0521 | 162.5107 | -4.4913 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.0081 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.0081 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.166 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.166 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C7 | 1388 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.842 |
| Bottom | 9528 | 1.94 | 0.845 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6508.6149 | 1.1991 | 192.872 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6543.3334 | 5.7403 | -193.9008 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8787 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8787 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.001 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.001 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C8 | 1389 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.743 |
| Bottom | 8734 | 1.78 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5562.3479 | -2.9643 | 164.8309 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5597.0664 | 165.8597 | -4.5852 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8351 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.8351 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6286 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.6286 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C9 | 1390 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.617 |
| Bottom | 8734 | 1.46 | 0.622 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5272.7852 | -138.6743 | 2.9691 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5315.2977 | -139.7923 | 2.2138 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.7398 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.7398 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1073 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1073 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C10 | 1391 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.638 |
| Bottom | 8734 | 1.46 | 0.643 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5453.4577 | 143.4259 | 4.4232 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5495.9701 | -144.544 | 6.3697 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6767 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6767 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.5205 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.5205 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C11 | 1392 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.596 |
| Bottom | 8734 | 1.46 | 0.601 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5089.949 | 133.8657 | 3.2448 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5132.4614 | 134.9837 | 2.087 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9396 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9396 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0029 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0029 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C12 | 1393 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.604 |
| Bottom | 8734 | 1.46 | 0.608 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5158.0863 | 135.6577 | 4.9591 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5200.5987 | 136.7757 | 5.3645 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.1185 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.1185 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1905 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1905 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C1 | 1609 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.876 |
| Bottom | 9528 | 1.94 | 0.88 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6778.2394 | 200.8618 | -2.0312 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6812.9579 | -3.1958 | 201.8907 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.287 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.287 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5648 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.5648 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C2 | 1610 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.783 |
| Bottom | 8734 | 1.78 | 0.788 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5864.4299 | 173.7826 | -1.5318 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5899.1484 | -174.8114 | 0.7471 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3253 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3253 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0487 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0487 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C3 | 1611 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.868 |
| Bottom | 9528 | 1.94 | 0.871 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6708.9703 | 198.8092 | 1.1882 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6743.6888 | -199.838 | -4.7119 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9722 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9722 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3554 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.3554 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C4 | 1612 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.771 |
| Bottom | 8734 | 1.78 | 0.775 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5769.134 | 170.9587 | 0.7812 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5803.8525 | -171.9875 | -2.0688 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.378 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.378 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5212 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5212 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C5 | 1613 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.861 |
| Bottom | 9528 | 1.94 | 0.865 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6659.3302 | -0.3487 | -197.3382 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6694.0487 | 198.367 | 3.5497 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1522 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1522 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3217 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3217 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C6 | 1614 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.761 |
| Bottom | 8734 | 1.78 | 0.764 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5694.1837 | 0.3221 | -168.7376 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5728.9022 | 169.7665 | -3.7902 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.4687 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.4687 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4377 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4377 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C7 | 1615 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.881 |
| Bottom | 9528 | 1.94 | 0.883 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6806.5594 | 0.2766 | 201.701 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6841.2779 | 5.6681 | -202.7299 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5491 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.5491 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.476 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.476 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C8 | 1616 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.778 |
| Bottom | 8734 | 1.78 | 0.78 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5818.6462 | -1.3277 | 172.4259 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5853.3647 | 173.4547 | -4.8641 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0546 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0546 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.623 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.623 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C9 | 1617 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.643 |
| Bottom | 8734 | 1.46 | 0.649 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5496.8255 | 144.5665 | 4.1856 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5539.3379 | 145.6846 | 2.2348 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3446 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3446 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3075 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.3075 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C10 | 1618 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.664 |
| Bottom | 8734 | 1.46 | 0.668 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5670.639 | 149.1378 | 3.1978 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5713.1514 | -150.2559 | 6.068 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.1951 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.1951 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.703 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.703 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C11 | 1619 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.622 |
| Bottom | 8734 | 1.46 | 0.628 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5318.4325 | 139.8748 | 4.3331 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5360.945 | 140.9929 | 2.2048 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4258 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4258 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.2183 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.2183 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C12 | 1620 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.629 |
| Bottom | 8734 | 1.46 | 0.634 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5377.0287 | 141.4159 | 3.5661 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5419.5412 | 142.5339 | 5.1335 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.5253 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.5253 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3903 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.3903 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C1 | 1836 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.86 |
| Bottom | 11116 | 2.27 | 0.864 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7077.0007 | 209.7151 | -1.3736 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7111.7192 | -2.9967 | 210.7439 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0016 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0016 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2461 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2461 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C2 | 1837 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.792 |
| Bottom | 9528 | 1.94 | 0.797 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6124.4261 | 181.4872 | -0.7332 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6159.1446 | -182.516 | 0.3019 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6564 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.6564 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.841 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.841 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C3 | 1838 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.852 |
| Bottom | 11116 | 2.27 | 0.855 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7008.2218 | 207.677 | 0.4152 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7042.9403 | -208.7058 | -4.9338 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6871 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6871 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0752 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.0752 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C4 | 1839 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.78 |
| Bottom | 9528 | 1.94 | 0.784 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6026.6703 | 178.5903 | -0.1242 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6061.3888 | -179.6192 | -1.7019 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7113 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7113 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3074 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.3074 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C5 | 1840 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.846 |
| Bottom | 11116 | 2.27 | 0.849 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6958.9672 | 0.0228 | -206.2174 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6993.6857 | 207.2462 | 3.7305 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8794 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.8794 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1034 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.1034 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C6 | 1841 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.769 |
| Bottom | 9528 | 1.94 | 0.772 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5942.8112 | 176.1053 | -0.0055 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5977.5297 | 177.1341 | -4.1632 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0993 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0993 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2826 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2826 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C7 | 1842 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.864 |
| Bottom | 11116 | 2.27 | 0.867 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7110.999 | 0.6801 | 210.7226 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7145.7175 | 5.1473 | -211.7514 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3318 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3318 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0244 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0244 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C8 | 1843 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.786 |
| Bottom | 9528 | 1.94 | 0.79 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6079.4574 | -180.1546 | 0.3458 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6114.1759 | 181.1834 | -4.0075 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1863 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1863 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.2889 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.2889 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C9 | 1844 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.651 |
| Bottom | 9528 | 1.59 | 0.656 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5720.3978 | 150.4465 | 4.1129 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5762.9102 | 151.5645 | 2.3158 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.232 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.232 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1921 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1921 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C10 | 1845 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.67 |
| Bottom | 9528 | 1.59 | 0.674 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5888.2082 | 154.8599 | 3.2546 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5930.7207 | -155.978 | 5.8534 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.0837 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.0837 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.5076 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.5076 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C11 | 1846 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.631 |
| Bottom | 9528 | 1.59 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5545.8912 | 145.8569 | 4.2778 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5588.4037 | 146.975 | 2.2685 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3315 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3315 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0977 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0977 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C12 | 1847 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.637 |
| Bottom | 9528 | 1.59 | 0.641 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5595.637 | 147.1653 | 3.6035 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5638.1494 | 148.2833 | 4.9481 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.4389 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.4389 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.2458 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.2458 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C1 | 2063 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.897 |
| Bottom | 11116 | 2.27 | 0.901 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7381.2609 | 218.7314 | -1.3642 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7415.9794 | -2.8581 | 219.7602 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0086 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0086 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1061 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1061 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C2 | 2064 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.826 |
| Bottom | 9528 | 1.94 | 0.831 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6388.3404 | 189.3078 | -0.6099 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6423.0589 | -190.3366 | -0.0361 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4027 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4027 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7545 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7545 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C3 | 2065 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.889 |
| Bottom | 11116 | 2.27 | 0.892 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7312.9057 | 216.7058 | 0.3006 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7347.6242 | -217.7346 | -5.0339 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6939 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6939 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9801 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9801 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C4 | 2066 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.813 |
| Bottom | 9528 | 1.94 | 0.818 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6288.1854 | 186.3399 | -0.3488 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6322.9039 | -187.3687 | -1.4314 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4622 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4622 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.229 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.229 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C5 | 2067 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.883 |
| Bottom | 11116 | 2.27 | 0.886 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7264.1333 | 0.1019 | -215.2605 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7298.8518 | 216.2893 | 3.9031 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8919 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.8919 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0476 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0476 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C6 | 2068 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.801 |
| Bottom | 9528 | 1.94 | 0.804 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6195.26 | 183.5862 | 0.1907 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6229.9785 | 184.615 | -4.4649 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3752 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.3752 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2422 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2422 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C7 | 2069 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.902 |
| Bottom | 11116 | 2.27 | 0.905 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7422.0545 | 0.7775 | 219.9402 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7456.773 | 4.4947 | -220.969 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3597 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3597 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6703 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6703 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C8 | 2070 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.821 |
| Bottom | 9528 | 1.94 | 0.824 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6344.907 | -188.0207 | 0.1257 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6379.6255 | 189.0496 | -3.2662 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6915 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6915 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0821 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.0821 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C9 | 2071 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.676 |
| Bottom | 9528 | 1.59 | 0.681 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5943.3641 | 156.3105 | 4.075 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5985.8765 | 157.4286 | 2.4593 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.1016 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.1016 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0433 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0433 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C10 | 2072 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.695 |
| Bottom | 9528 | 1.59 | 0.699 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6105.9891 | 160.5875 | 3.3643 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6148.5016 | -161.7056 | 5.5536 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9032 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9032 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.2916 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.2916 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C11 | 2073 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.657 |
| Bottom | 9528 | 1.59 | 0.662 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5772.2155 | 151.8093 | 4.1962 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5814.7279 | 152.9273 | 2.4103 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.1791 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.1791 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0401 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0401 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C12 | 2074 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.662 |
| Bottom | 9528 | 1.59 | 0.666 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5813.7662 | 152.9021 | 3.6665 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5856.2787 | 154.0201 | 4.691 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.3048 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.3048 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0788 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0788 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C1 | 2290 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.881 |
| Bottom | 12704 | 2.59 | 0.885 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7691.1674 | 227.9149 | -0.6882 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7725.8859 | -3.4855 | 228.9438 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6232 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6232 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1875 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1875 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C2 | 2291 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.834 |
| Bottom | 10322 | 2.11 | 0.838 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6656.3248 | 197.2491 | -0.048 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6691.0433 | -198.2779 | 0.484 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3807 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.3807 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6874 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6874 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C3 | 2292 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.874 |
| Bottom | 12704 | 2.59 | 0.876 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7623.1752 | 225.9001 | -0.5607 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7657.8937 | -6.4921 | -226.9289 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3939 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3939 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0747 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.0747 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C4 | 2293 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.821 |
| Bottom | 10322 | 2.11 | 0.825 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6553.8221 | 194.2116 | -1.0664 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6588.5406 | -195.2404 | -2.1635 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4992 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4992 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1786 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1786 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C5 | 2294 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.868 |
| Bottom | 12704 | 2.59 | 0.871 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7575.0732 | 0.5696 | -224.4747 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7609.7917 | 225.5035 | 5.1547 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2582 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2582 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2975 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.2975 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C6 | 2295 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.809 |
| Bottom | 10322 | 2.11 | 0.812 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6451.5928 | 0.608 | 191.1822 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6486.3113 | 192.211 | -3.9577 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4218 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4218 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3613 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3613 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C7 | 2296 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.887 |
| Bottom | 12704 | 2.59 | 0.89 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7739.9871 | 229.3616 | 0.1459 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 7774.7056 | 5.3591 | -230.3904 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9938 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9938 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8374 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8374 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C8 | 2297 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.829 |
| Bottom | 10322 | 2.11 | 0.832 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6615.1438 | -0.9507 | -196.0288 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6649.8623 | 197.0576 | -3.313 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3952 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3952 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9255 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.9255 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C9 | 2298 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.682 |
| Bottom | 10322 | 1.72 | 0.687 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6165.5393 | 162.1537 | 4.0871 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6208.0518 | 163.2718 | 2.6994 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9429 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9429 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0787 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0787 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C10 | 2299 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.7 |
| Bottom | 10322 | 1.72 | 0.704 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6323.757 | 166.3148 | 3.4261 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6366.2695 | -167.4329 | 5.1766 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.7106 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.7106 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.113 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.113 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C11 | 2300 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.664 |
| Bottom | 10322 | 1.72 | 0.669 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5997.244 | 157.7275 | 4.151 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6039.7565 | 158.8456 | 2.5897 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.0227 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.0227 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1282 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.1282 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C12 | 2301 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.668 |
| Bottom | 10322 | 1.72 | 0.672 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6031.2265 | 158.6213 | 3.6459 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 6073.739 | 159.7393 | 4.2675 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.1298 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.1298 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.0243 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 0.0243 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C1 | 2539 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.835 |
| Bottom | 6352 | 1.3 | 0.838 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5630.9615 | 2.0275 | -166.8642 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5665.68 | -7.5968 | -167.893 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9819 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9819 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5729 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.5729 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C2 | 2540 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.694 |
| Bottom | 7146 | 1.46 | 0.698 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4858.7174 | 5.0923 | -143.98 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4881.8631 | -2.4345 | -144.6659 | 630 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1432 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1432 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3909 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.3909 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C3 | 2541 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.825 |
| Bottom | 6352 | 1.3 | 0.827 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5558.8353 | -0.71 | 164.7268 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5593.5538 | -165.7556 | 7.2465 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3943 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.3943 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7152 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7152 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C4 | 2542 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.682 |
| Bottom | 7146 | 1.46 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4774.5332 | 3.9634 | 141.4853 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4809.2517 | -6.626 | 142.5142 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9443 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9443 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0201 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.0201 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C5 | 2543 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.817 |
| Bottom | 6352 | 1.3 | 0.82 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5508.258 | 1.4114 | -163.228 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5542.9765 | 164.2569 | -7.8489 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6258 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.6258 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2697 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.2697 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C6 | 2544 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.678 |
| Bottom | 7146 | 1.46 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4733.6371 | -1.3158 | -140.2734 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4768.3556 | 6.4808 | -141.3023 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.242 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.242 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6989 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6989 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C7 | 2545 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.838 |
| Bottom | 6352 | 1.3 | 0.841 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5646.1842 | -0.3217 | 167.3153 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5680.9027 | 168.3441 | 5.8329 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7621 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.7621 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9121 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9121 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C8 | 2546 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.689 |
| Bottom | 7146 | 1.46 | 0.692 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4816.7233 | -3.225 | 142.7356 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4851.4418 | 143.7644 | 5.3805 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4339 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4339 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8307 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.8307 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C9 | 2547 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.697 |
| Bottom | 6352 | 1.32 | 0.703 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4624.448 | -121.623 | 2.3375 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4658.4579 | -122.5174 | -0.8958 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.1112 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.1112 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6912 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.6912 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C10 | 2548 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.729 |
| Bottom | 6352 | 1.32 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4837.3264 | -127.2217 | 2.3878 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4871.3364 | -128.1161 | 10.8367 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.0352 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.0352 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7314 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.7314 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C11 | 2549 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.668 |
| Bottom | 6352 | 1.32 | 0.671 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4426.1449 | 116.4076 | 0.7664 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4460.1548 | 117.3021 | -4.0688 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.9445 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.9445 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8297 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.8297 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C12 | 2550 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.683 |
| Bottom | 6352 | 1.32 | 0.686 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4530.2437 | 119.1454 | 1.3873 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4564.2536 | 120.0399 | 7.1422 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.6359 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.6359 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.9392 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.9392 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C1 | 2824 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.38 |
| Bottom | 3054 | 0.62 | 0.388 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2181.0995 | 64.6332 | -4.5502 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2215.818 | 0.0409 | 65.6621 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9294 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.9294 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8418 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8418 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C2 | 2825 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.325 |
| Bottom | 3054 | 0.62 | 0.33 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1864.7028 | 55.2574 | -4.5403 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1899.4213 | -56.2862 | 6.4979 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9736 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9736 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7041 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.7041 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C3 | 2826 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.377 |
| Bottom | 3054 | 0.62 | 0.383 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2156.795 | 63.913 | -2.2542 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2191.5135 | -1.1268 | -64.9418 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4922 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4922 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5368 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.5368 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C4 | 2827 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.316 |
| Bottom | 3054 | 0.62 | 0.319 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1809.8682 | 53.6324 | -2.0915 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1821.4411 | -0.3179 | -53.9754 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.518 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.518 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.1345 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.1345 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C5 | 2828 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.371 |
| Bottom | 3054 | 0.62 | 0.376 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2127.7894 | 63.0535 | 3.1895 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2162.5079 | 64.0823 | 6.3229 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7557 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7557 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2413 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2413 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C6 | 2829 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.316 |
| Bottom | 3054 | 0.62 | 0.321 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1810.4419 | 2.3304 | 53.6494 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1845.1604 | 54.6783 | 4.0435 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4009 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4009 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6905 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.6905 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C7 | 2830 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.386 |
| Bottom | 3054 | 0.62 | 0.391 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2205.5442 | 65.3576 | 0.5175 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2240.2627 | 2.4811 | -66.3865 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2544 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.2544 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1437 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.1437 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C8 | 2831 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.324 |
| Bottom | 3054 | 0.62 | 0.326 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1852.2083 | -54.8871 | 0.6762 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1886.9268 | 55.9159 | -9.133 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1337 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5115 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.5115 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C9 | 2832 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.403 |
| Bottom | 3078 | 0.64 | 0.409 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2271.6671 | 59.7448 | 5.1952 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2305.677 | -60.6393 | 5.3721 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.3785 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.3785 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.3172 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.3172 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C10 | 2833 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.465 |
| Bottom | 3078 | 0.64 | 0.47 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2614.1692 | 68.7527 | 4.0161 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2648.1792 | -69.6471 | 6.0238 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.5439 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.5439 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.8351 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.8351 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C11 | 2834 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.351 |
| Bottom | 3078 | 0.64 | 0.358 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1977.1006 | -51.9977 | 3.6466 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2011.1105 | 52.8922 | 2.515 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9645 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9645 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.1419 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.1419 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C12 | 2835 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.367 |
| Bottom | 3078 | 0.64 | 0.373 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2061.9225 | -54.2286 | 2.3583 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2095.9325 | 55.123 | 2.7253 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.1689 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.1689 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.5726 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.5726 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C1 | 3110 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.436 |
| Bottom | 3054 | 0.62 | 0.442 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2493.2016 | 73.8819 | -1.1405 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2527.9201 | -2.1623 | 74.9107 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9263 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9263 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1918 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.1918 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C2 | 3111 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.376 |
| Bottom | 3054 | 0.62 | 0.381 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2143.4386 | 63.5172 | 0.1437 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2178.1571 | -64.5461 | 0.6316 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4241 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4241 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4365 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.4365 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C3 | 3112 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.432 |
| Bottom | 3054 | 0.62 | 0.438 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2464.2854 | 73.025 | -0.4447 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2499.0039 | -0.5998 | -74.0538 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.3555 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.3555 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9713 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9713 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C4 | 3113 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.365 |
| Bottom | 3054 | 0.62 | 0.37 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2083.4479 | 0.2174 | -61.7395 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2118.1664 | -62.7683 | -3.0983 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6599 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.6599 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3713 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3713 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C5 | 3114 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.426 |
| Bottom | 3054 | 0.62 | 0.43 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2432.6249 | -0.7789 | -72.0868 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2467.3434 | 73.1156 | 4.5497 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5846 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.5846 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.588 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.588 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C6 | 3115 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.364 |
| Bottom | 3054 | 0.62 | 0.37 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2079.4788 | 61.6219 | -0.755 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2114.1973 | 62.6507 | 0.844 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9419 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.9419 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6411 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6411 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C7 | 3116 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.439 |
| Bottom | 3054 | 0.62 | 0.443 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2513.0152 | -2.265 | 74.469 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2547.7337 | 7.8907 | -75.4978 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1122 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1122 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9541 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9541 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C8 | 3117 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.372 |
| Bottom | 3054 | 0.62 | 0.376 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2125.8946 | 0.6577 | 62.9973 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2160.6131 | 64.0262 | -6.5443 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0799 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.0799 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6116 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.6116 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C9 | 3118 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.438 |
| Bottom | 3078 | 0.64 | 0.446 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2467.6811 | -64.9 | 5.0119 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2501.691 | 65.7945 | 1.4495 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.3453 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.3453 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.729 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.729 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C10 | 3119 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.496 |
| Bottom | 3078 | 0.64 | 0.5 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2782.5384 | -73.1808 | 0.713 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2816.5484 | -1.558 | 92.8522 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.935 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.935 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1211 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1211 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C11 | 3120 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.389 |
| Bottom | 3078 | 0.64 | 0.397 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2188.1327 | 57.5479 | 3.8662 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2222.1426 | -58.4424 | -0.3105 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.5813 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.5813 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.5568 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.5568 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C12 | 3121 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.405 |
| Bottom | 3078 | 0.64 | 0.409 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2269.6736 | 59.6924 | -0.1452 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2303.6836 | 0.1272 | 75.9448 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1056 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.1056 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3758 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.3758 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C1 | 3396 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.491 |
| Bottom | 3054 | 0.62 | 0.497 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2807.3944 | 83.1925 | -2.9767 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2842.1129 | -1.7725 | 84.2213 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8212 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8212 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3316 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3316 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C2 | 3397 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.423 |
| Bottom | 3054 | 0.62 | 0.429 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2420.1577 | 71.7173 | -2.5232 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2454.8762 | -72.7462 | 2.6157 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8828 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.8828 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3115 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.3115 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C3 | 3398 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.485 |
| Bottom | 3054 | 0.62 | 0.492 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2773.8533 | 82.1985 | 1.3535 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2808.5718 | -0.3092 | -83.2273 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0165 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0165 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9914 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9914 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C4 | 3399 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.412 |
| Bottom | 3054 | 0.62 | 0.417 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2355.6328 | 69.8053 | 1.2052 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2390.3513 | -70.8341 | -4.7715 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9927 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9927 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6962 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.6962 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C5 | 3400 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.48 |
| Bottom | 3054 | 0.62 | 0.483 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2739.8915 | 1.2841 | -81.1921 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2774.61 | 82.2209 | 6.3781 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.733 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.733 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0406 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0406 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C6 | 3401 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.411 |
| Bottom | 3054 | 0.62 | 0.416 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2347.2095 | -0.3102 | -69.5556 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2381.928 | 70.5845 | 2.8628 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5571 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5571 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7643 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7643 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C7 | 3402 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.494 |
| Bottom | 3054 | 0.62 | 0.497 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2823.5658 | 1.0125 | 83.6717 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2858.2843 | 7.2266 | -84.7005 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4511 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.4511 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.845 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.845 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C8 | 3403 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.419 |
| Bottom | 3054 | 0.62 | 0.422 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2397.7865 | -1.9185 | 71.0544 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2432.505 | 72.0832 | -9.1503 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6209 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6209 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9522 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.9522 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C9 | 3404 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.475 |
| Bottom | 3078 | 0.64 | 0.481 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2667.1699 | 70.1466 | 3.0877 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2701.1799 | 71.041 | 2.2193 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9262 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9262 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.7056 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.7056 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C10 | 3405 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.527 |
| Bottom | 3078 | 0.64 | 0.531 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2958.5249 | 77.8092 | 3.0511 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2992.5349 | -78.7037 | 8.8608 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.5563 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.5563 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6221 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.6221 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C11 | 3406 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.427 |
| Bottom | 3078 | 0.64 | 0.434 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2400.8976 | -63.1436 | 2.6544 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2434.9076 | 64.0381 | 0.9302 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2989 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2989 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.7937 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.7937 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C12 | 3407 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.442 |
| Bottom | 3078 | 0.64 | 0.446 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2480.5659 | -65.2389 | 2.7494 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2514.5758 | 66.1333 | 6.6415 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6599 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6599 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.0999 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.0999 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C1 | 3682 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.546 |
| Bottom | 3054 | 0.62 | 0.552 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3121.7113 | 92.5067 | -1.805 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3156.4298 | -2.4236 | 93.5355 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2871 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.2871 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6473 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6473 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C2 | 3683 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.472 |
| Bottom | 3054 | 0.62 | 0.477 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2695.4213 | 79.8743 | -1.2037 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2730.1398 | -80.9031 | 2.8002 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2915 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2915 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4624 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.4624 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C3 | 3684 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.54 |
| Bottom | 3054 | 0.62 | 0.546 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3083.6436 | 91.3786 | 0.4341 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3118.3621 | -0.7422 | -92.4075 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5102 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.5102 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2121 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2121 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C4 | 3685 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.46 |
| Bottom | 3054 | 0.62 | 0.464 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2626.8827 | 77.8433 | 0.0967 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2661.6012 | -78.8721 | -4.7831 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4013 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4013 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.89 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.89 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C5 | 3686 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.534 |
| Bottom | 3054 | 0.62 | 0.537 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3047.4918 | 0.9444 | -90.3073 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3082.2103 | 91.3362 | 6.3482 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1149 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.1149 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2247 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.2247 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C6 | 3687 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.458 |
| Bottom | 3054 | 0.62 | 0.463 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2614.1574 | 77.4662 | -0.5136 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2648.8759 | 78.495 | 2.8197 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8649 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8649 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.951 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.951 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C7 | 3688 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.549 |
| Bottom | 3054 | 0.62 | 0.552 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3135.0055 | 0.8775 | 92.9007 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3169.724 | 7.3702 | -93.9295 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6419 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6419 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9746 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.9746 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C8 | 3689 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.467 |
| Bottom | 3054 | 0.62 | 0.469 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2668.6616 | -0.8097 | 79.0813 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2703.3801 | 80.1102 | -9.304 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7279 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7279 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.0938 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.0938 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C9 | 3690 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.511 |
| Bottom | 3078 | 0.64 | 0.518 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2870.5583 | 75.4957 | 3.4221 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2904.5682 | 76.3901 | 1.6451 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4056 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4056 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2854 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2854 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C10 | 3691 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.56 |
| Bottom | 3078 | 0.64 | 0.563 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3142.3603 | 82.6441 | 1.8157 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3176.3703 | -83.5385 | 8.5556 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.0551 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.0551 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.0321 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.0321 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C11 | 3692 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.466 |
| Bottom | 3078 | 0.64 | 0.473 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2616.1757 | -68.8054 | 3.2374 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2650.1857 | 69.6999 | 0.5479 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.8146 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.8146 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3706 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3706 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C12 | 3693 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.48 |
| Bottom | 3078 | 0.64 | 0.485 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2695.1033 | -70.8812 | 1.8271 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2729.1132 | 71.7757 | 6.4138 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.022 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.022 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5911 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.5911 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C1 | 3968 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.601 |
| Bottom | 3054 | 0.62 | 0.607 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3436.3497 | 101.8305 | -1.7163 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3471.0682 | -2.4501 | 102.8593 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1443 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.1443 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4346 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4346 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C2 | 3969 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.502 |
| Bottom | 3693 | 0.75 | 0.507 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2969.318 | 87.9908 | -1.0872 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3004.0365 | -89.0196 | 2.5786 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1236 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1236 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4327 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.4327 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C3 | 3970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.594 |
| Bottom | 3054 | 0.62 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3393.8319 | 100.5706 | 0.4423 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3428.5504 | -0.6914 | -101.5994 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3622 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3622 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0489 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0489 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C4 | 3971 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.49 |
| Bottom | 3693 | 0.75 | 0.494 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2897.2456 | 85.855 | 0.0758 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2931.9641 | -86.8839 | -4.4848 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2249 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2249 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8859 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.8859 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C5 | 3972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.588 |
| Bottom | 3054 | 0.62 | 0.591 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3355.6033 | 0.8936 | -99.4377 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3390.3218 | 100.4665 | 6.0381 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9892 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9892 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9705 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9705 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C6 | 3973 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.487 |
| Bottom | 3693 | 0.75 | 0.492 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2880.3936 | 0.4688 | -85.3557 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2915.1121 | 86.3845 | 2.4746 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.713 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.713 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9122 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.9122 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C7 | 3974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.604 |
| Bottom | 3054 | 0.62 | 0.607 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3447.5124 | 0.9855 | 102.1613 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3482.2309 | 6.9265 | -103.1901 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4286 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.4286 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6731 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6731 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C8 | 3975 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.497 |
| Bottom | 3693 | 0.75 | 0.499 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2938.6426 | -1.0452 | 87.0818 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2973.3611 | 88.1106 | -9.0401 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4404 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.4404 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.027 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.027 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C9 | 3976 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.531 |
| Bottom | 3663 | 0.76 | 0.538 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3077.6611 | 80.9425 | 3.0283 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3111.671 | 81.8369 | 1.3005 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3783 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3783 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2284 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2284 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C10 | 3977 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.576 |
| Bottom | 3663 | 0.76 | 0.579 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3333.3486 | 87.6671 | 1.6445 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3367.3586 | -88.5615 | 8.0754 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8981 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8981 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.8682 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.8682 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C11 | 3978 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.489 |
| Bottom | 3663 | 0.76 | 0.496 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2833.8987 | 74.5315 | 2.9239 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2867.9086 | 75.426 | 0.3688 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.7472 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.7472 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.297 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.297 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C12 | 3979 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.503 |
| Bottom | 3663 | 0.76 | 0.507 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2913.078 | 76.614 | 1.7432 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2947.0879 | 77.5084 | 6.0246 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.8573 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.8573 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4805 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.4805 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C1 | 4254 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.656 |
| Bottom | 3054 | 0.62 | 0.662 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3751.0499 | 111.1561 | -1.7981 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3785.7684 | -2.5807 | 112.1849 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1071 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.1071 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4546 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4546 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C2 | 4255 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.548 |
| Bottom | 3693 | 0.75 | 0.554 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3241.9987 | 96.0712 | -1.1733 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3276.7172 | -97.1001 | 2.4152 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0907 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0907 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3909 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.3909 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C3 | 4256 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.649 |
| Bottom | 3054 | 0.62 | 0.655 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3704.1606 | 109.7666 | 0.5362 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3738.8791 | -0.8004 | -110.7954 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3223 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3223 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0942 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0942 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C4 | 4257 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.536 |
| Bottom | 3693 | 0.75 | 0.54 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3166.8429 | 93.8441 | 0.1704 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3201.5614 | -94.8729 | -4.3253 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1832 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1832 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8823 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.8823 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C5 | 4258 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.642 |
| Bottom | 3054 | 0.62 | 0.645 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3663.9418 | 0.5838 | -108.5748 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3698.6603 | 109.6036 | 5.8035 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9621 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9621 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9729 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9729 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C6 | 4259 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.533 |
| Bottom | 3693 | 0.75 | 0.537 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3146.0472 | 0.2484 | -93.2279 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3180.7657 | 94.2567 | 2.2247 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6755 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6755 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8911 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8911 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C7 | 4260 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.659 |
| Bottom | 3054 | 0.62 | 0.662 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3760.7832 | 0.7694 | 111.4445 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3795.5017 | 6.6415 | -112.4734 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3086 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.3086 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.629 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.629 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C8 | 4261 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.543 |
| Bottom | 3693 | 0.75 | 0.545 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3207.9222 | -1.193 | 95.0614 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3242.6407 | 96.0903 | -8.7586 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2613 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.2613 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.947 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.947 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C9 | 4262 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.567 |
| Bottom | 3663 | 0.76 | 0.574 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3288.334 | 86.4832 | 2.7818 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3322.344 | 87.3776 | 1.0363 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3858 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3858 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1453 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1453 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C10 | 4263 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.61 |
| Bottom | 3663 | 0.76 | 0.613 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3530.9261 | 92.8634 | 1.4163 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3564.9361 | -93.7578 | 7.6687 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8098 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8098 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6758 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.6758 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C11 | 4264 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.527 |
| Bottom | 3663 | 0.76 | 0.534 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3054.0148 | 80.3206 | 2.7245 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3088.0248 | 81.2151 | 0.2073 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.7292 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.7292 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2024 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2024 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C12 | 4265 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.541 |
| Bottom | 3663 | 0.76 | 0.545 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3134.3336 | 82.433 | 1.5811 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3168.3436 | 83.3274 | 5.6502 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.7435 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.7435 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3522 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3522 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C1 | 4540 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.687 |
| Bottom | 3693 | 0.75 | 0.693 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4065.6518 | 120.4788 | -1.8233 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4100.3703 | -2.6861 | 121.5076 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0595 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0595 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4364 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4364 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C2 | 4541 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.546 |
| Bottom | 5376 | 1.1 | 0.551 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3513.5749 | 104.1189 | -1.1924 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3548.2934 | -105.1478 | 2.2907 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0406 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.0406 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3391 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.3391 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C3 | 4542 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.679 |
| Bottom | 3693 | 0.75 | 0.685 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4014.4603 | 118.9618 | 0.4978 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4049.1788 | -0.9432 | -119.9907 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2709 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2709 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1045 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1045 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C4 | 4543 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.534 |
| Bottom | 5376 | 1.1 | 0.538 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3435.7702 | 101.8133 | 0.1238 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3470.4887 | -102.8421 | -4.2716 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1244 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1244 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8668 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.8668 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C5 | 4544 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.672 |
| Bottom | 3693 | 0.75 | 0.676 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3972.3289 | 0.4377 | -117.7133 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4007.0474 | 118.7422 | 5.6823 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9358 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9358 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9517 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9517 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C6 | 4545 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.531 |
| Bottom | 5376 | 1.1 | 0.535 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3411.2153 | 0.1148 | -101.0857 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3445.9338 | 102.1145 | 2.0834 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6317 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.6317 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8648 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8648 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C7 | 4546 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.69 |
| Bottom | 3693 | 0.75 | 0.693 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4074.6342 | 0.6419 | 120.745 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4109.3527 | 6.428 | -121.7738 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.1935 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.1935 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5781 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5781 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C8 | 4547 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.54 |
| Bottom | 5376 | 1.1 | 0.542 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3476.6476 | -1.3071 | 103.0247 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3511.366 | 104.0535 | -8.5025 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0791 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.0791 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8724 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8724 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C9 | 4548 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.593 |
| Bottom | 4032 | 0.84 | 0.599 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3502.4815 | 92.1153 | 2.6004 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3536.4915 | 93.0097 | 0.865 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3777 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3777 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0654 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0654 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C10 | 4549 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.633 |
| Bottom | 4032 | 0.84 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3734.6573 | 98.2215 | 1.2692 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3768.6672 | -99.1159 | 7.3081 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.7032 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.7032 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.49 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.49 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C11 | 4550 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.554 |
| Bottom | 4032 | 0.84 | 0.561 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3276.5153 | 86.1724 | 2.5381 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3310.5252 | 87.0668 | 0.0865 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6952 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6952 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1141 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1141 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C12 | 4551 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.569 |
| Bottom | 4032 | 0.84 | 0.573 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3358.7855 | 88.3361 | 1.4429 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3392.7955 | 89.2305 | 5.2804 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6206 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6206 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2289 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2289 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C1 | 4826 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.741 |
| Bottom | 3693 | 0.75 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4379.9719 | 129.7932 | -1.8605 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4414.6904 | -2.7378 | 130.822 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9392 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9392 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4119 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4119 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C2 | 4827 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.588 |
| Bottom | 5376 | 1.1 | 0.593 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3784.1499 | 112.137 | -1.2348 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3818.8684 | -113.1658 | 2.007 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9161 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9161 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2859 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2859 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C3 | 4828 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.732 |
| Bottom | 3693 | 0.75 | 0.738 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4324.5371 | 128.1505 | 0.4019 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4359.2556 | -1.0934 | -129.1793 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1555 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.1555 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1118 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1118 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C4 | 4829 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.576 |
| Bottom | 5376 | 1.1 | 0.58 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3704.1288 | 109.7657 | 0.0324 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3738.8473 | -110.7945 | -4.1268 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9967 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9967 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8482 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.8482 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C5 | 4830 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.725 |
| Bottom | 3693 | 0.75 | 0.728 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4280.5655 | 0.3791 | -126.8474 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4315.284 | 127.8763 | 5.5292 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8519 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.8519 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9304 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9304 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C6 | 4831 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.572 |
| Bottom | 5376 | 1.1 | 0.576 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3675.9949 | 0.0461 | -108.932 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3710.7134 | 109.9608 | 1.8929 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5273 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.5273 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8432 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8432 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C7 | 4832 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.743 |
| Bottom | 3693 | 0.75 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4388.8693 | 0.5517 | 130.0568 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4423.5878 | 6.2823 | -131.0857 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0178 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.0178 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5459 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5459 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C8 | 4833 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.582 |
| Bottom | 5376 | 1.1 | 0.584 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3744.9513 | -110.9754 | 1.2767 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3779.6698 | 112.0042 | -8.1332 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8363 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.8363 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8119 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8119 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C9 | 4834 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.63 |
| Bottom | 4032 | 0.84 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3720.0265 | 97.8367 | 2.4928 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3754.0365 | 98.7312 | 0.7853 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3585 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3585 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0349 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0349 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C10 | 4835 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.668 |
| Bottom | 4032 | 0.84 | 0.671 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3944.1925 | 103.7323 | 1.19 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3978.2025 | -104.6267 | 6.9981 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.5885 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.5885 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.2822 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.2822 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C11 | 4836 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.593 |
| Bottom | 4032 | 0.84 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3501.3985 | 92.0868 | 2.3814 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3535.4085 | 92.9812 | 0.0132 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6504 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6504 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0075 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0075 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C12 | 4837 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.608 |
| Bottom | 4032 | 0.84 | 0.612 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3586.3924 | 94.3221 | 1.3259 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3620.4024 | 95.2166 | 4.92 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4929 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4929 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0874 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0874 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C1 | 5112 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.729 |
| Bottom | 5376 | 1.1 | 0.734 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4693.8145 | 139.0934 | -2.0215 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4728.533 | -3.0383 | 140.1222 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8035 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.8035 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.487 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.487 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C2 | 5113 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.601 |
| Bottom | 6352 | 1.3 | 0.607 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4053.8194 | 120.1282 | -1.4084 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4088.5379 | -121.157 | 1.5959 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7883 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7883 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1511 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.1511 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C3 | 5114 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.721 |
| Bottom | 5376 | 1.1 | 0.726 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4634.1801 | 137.3262 | 0.3454 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4668.8986 | -1.5239 | -138.355 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0388 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.0388 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2127 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2127 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C4 | 5115 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.59 |
| Bottom | 6352 | 1.3 | 0.593 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3972.025 | 117.7043 | -0.0164 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4006.7435 | -118.7332 | -3.9668 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8857 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8857 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.75 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.75 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C5 | 5116 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.714 |
| Bottom | 5376 | 1.1 | 0.717 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4588.4409 | 0.4822 | -135.9708 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4623.1594 | 136.9996 | 5.285 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.737 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.737 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9936 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9936 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C6 | 5117 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.585 |
| Bottom | 6352 | 1.3 | 0.59 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3940.4825 | -0.0748 | -116.7696 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3975.201 | 117.7985 | 1.6385 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.407 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.407 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7346 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.7346 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C7 | 5118 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.731 |
| Bottom | 5376 | 1.1 | 0.734 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4703.2896 | 0.5241 | 139.3741 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4738.0081 | 6.269 | -140.403 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7819 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.7819 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5542 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.5542 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C8 | 5119 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.595 |
| Bottom | 6352 | 1.3 | 0.598 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4012.9533 | -118.9172 | 1.3289 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4047.6718 | 119.946 | -7.5136 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5319 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.5319 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6395 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.6395 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C9 | 5120 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.622 |
| Bottom | 5376 | 1.12 | 0.628 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3940.9108 | 103.646 | 2.4276 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3974.9207 | 104.5404 | 0.7176 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.353 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.353 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2185 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2185 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C10 | 5121 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.657 |
| Bottom | 5376 | 1.12 | 0.66 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4159.2584 | 109.3885 | 1.1789 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4193.2683 | -0.6923 | 138.2381 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.4613 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.4613 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.9902 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.9902 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C11 | 5122 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.589 |
| Bottom | 5376 | 1.12 | 0.595 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3728.6701 | 98.064 | 2.2176 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3762.68 | 98.9585 | -0.1147 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6294 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6294 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.179 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.179 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C12 | 5123 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.603 |
| Bottom | 5376 | 1.12 | 0.607 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3817.1522 | 100.3911 | 1.2315 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3851.1621 | 101.2856 | 4.5629 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.356 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.356 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1353 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1353 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C1 | 5398 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.778 |
| Bottom | 5376 | 1.1 | 0.783 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5007.0395 | 148.3753 | -1.0322 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5041.758 | -2.4397 | 149.4041 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6652 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.6652 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2001 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2001 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C2 | 5399 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.642 |
| Bottom | 6352 | 1.3 | 0.645 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4322.6405 | 128.0942 | -0.3762 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4357.359 | -129.1231 | 4.33 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6957 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6957 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5425 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.5425 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C3 | 5400 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.769 |
| Bottom | 5376 | 1.1 | 0.774 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4943.2328 | 146.4845 | -0.9232 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4977.9513 | -1.177 | -147.5133 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9005 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9005 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9844 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9844 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C4 | 5401 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.629 |
| Bottom | 6352 | 1.3 | 0.632 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4239.5419 | 125.6318 | -1.3112 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4274.2604 | -126.6606 | -6.8736 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7568 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7568 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1062 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.1062 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C5 | 5402 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.761 |
| Bottom | 5376 | 1.1 | 0.763 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4895.7993 | 145.0789 | -0.4026 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4930.5178 | 146.1077 | 7.8576 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5435 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.5435 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7348 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7348 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C6 | 5403 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.624 |
| Bottom | 6352 | 1.3 | 0.628 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4204.7476 | 0.1828 | 124.6007 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4239.4661 | 125.6295 | 4.1513 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1833 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.1833 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1087 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1087 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C7 | 5404 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.78 |
| Bottom | 5376 | 1.1 | 0.783 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5017.7523 | 0.462 | 148.6927 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5052.4708 | 6.0317 | -149.7216 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5215 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5215 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4659 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.4659 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C8 | 5405 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.636 |
| Bottom | 6352 | 1.3 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4280.7347 | -126.8524 | 0.2594 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4315.4532 | 127.8813 | -9.9787 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2782 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.2782 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1197 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.1197 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C9 | 5406 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.658 |
| Bottom | 5376 | 1.12 | 0.664 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4165.1026 | 109.5422 | 2.3623 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4199.1125 | 110.4367 | 0.6752 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3318 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.3318 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.4337 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C10 | 5407 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.692 |
| Bottom | 5376 | 1.12 | 0.695 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4379.6608 | 115.1851 | 1.1985 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4413.6707 | 0.0847 | 145.504 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.2978 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.2978 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.7003 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.7003 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C11 | 5408 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.625 |
| Bottom | 5376 | 1.12 | 0.632 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3958.3503 | -104.1046 | 2.0765 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 3992.3602 | -104.9991 | -0.0672 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.527 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.527 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3799 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3799 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C12 | 5409 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.64 |
| Bottom | 5376 | 1.12 | 0.644 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4051.1104 | 106.5442 | 1.1833 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4085.1204 | -107.4387 | 4.2718 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2311 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2311 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3511 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3511 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C1 | 5684 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.79 |
| Bottom | 6352 | 1.3 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5319.1662 | 157.6246 | -0.5737 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5353.8847 | -0.6071 | 158.6534 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6786 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6786 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7979 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7979 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C2 | 5685 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.657 |
| Bottom | 7146 | 1.46 | 0.662 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4590.6959 | 136.0376 | -0.16 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4625.4144 | -137.0664 | 0.2347 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.446 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.446 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6413 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.6413 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C3 | 5686 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.779 |
| Bottom | 6352 | 1.3 | 0.785 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5251.182 | 155.61 | -1.7563 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5285.9005 | 0.7094 | -156.6389 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9945 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.9945 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5127 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.5127 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C4 | 5687 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.645 |
| Bottom | 7146 | 1.46 | 0.648 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4506.7971 | 2.7765 | -133.5514 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4541.5156 | -134.5802 | -3.452 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6635 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.6635 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5312 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5312 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C5 | 5688 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.773 |
| Bottom | 6352 | 1.3 | 0.775 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5202.152 | -154.1571 | 0.2901 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5236.8705 | 155.1859 | 5.1069 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.776 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.776 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2777 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2777 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C6 | 5689 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.64 |
| Bottom | 7146 | 1.46 | 0.644 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4468.8926 | 0.4468 | 132.4282 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4503.6111 | 133.457 | 1.4221 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4284 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.4284 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4809 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.4809 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C7 | 5690 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.792 |
| Bottom | 6352 | 1.3 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5331.8316 | -157.9999 | 0.2335 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 5366.5501 | 3.6396 | -159.0288 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4901 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.4901 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7831 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7831 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C8 | 5691 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.651 |
| Bottom | 7146 | 1.46 | 0.654 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4548.3833 | -1.2786 | 134.7838 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4583.1018 | 135.8126 | -5.5009 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.8337 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0414 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.0414 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C9 | 5692 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.662 |
| Bottom | 6352 | 1.32 | 0.667 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4392.6812 | 115.5275 | 2.76 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4426.6912 | 116.422 | 1.7927 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.9348 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.9348 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0362 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0362 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C10 | 5693 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.695 |
| Bottom | 6352 | 1.32 | 0.698 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4605.3597 | 121.121 | 0.6385 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4639.3697 | -122.0154 | 4.6664 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.676 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.676 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.899 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.899 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C11 | 5694 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.631 |
| Bottom | 6352 | 1.32 | 0.637 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4190.5686 | 110.212 | 2.3139 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4224.5786 | 111.1064 | 0.6971 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2406 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2406 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0392 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0392 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C12 | 5695 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.647 |
| Bottom | 6352 | 1.32 | 0.651 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4288.4325 | 112.7858 | 0.39 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 4322.4424 | 113.6802 | 1.981 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.4362 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.4362 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0964 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0964 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C1 | 5970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.323 |
| Bottom | 3054 | 0.62 | 0.329 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1848.2296 | -2.3767 | -54.7692 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1882.9481 | 55.798 | 1.2618 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7705 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.7705 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4702 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4702 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C2 | 5971 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.275 |
| Bottom | 3054 | 0.62 | 0.281 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1580.1897 | 46.8263 | -4.7003 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1614.9082 | 3.9036 | -47.8551 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2557 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0.2557 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.645 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.645 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C3 | 5972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.319 |
| Bottom | 3054 | 0.62 | 0.324 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1823.3594 | -54.0322 | 1.3701 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1858.0778 | -2.8882 | -55.061 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0967 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0967 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.0038 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.0038 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C4 | 5973 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.269 |
| Bottom | 3054 | 0.62 | 0.273 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1535.0356 | 45.4882 | -0.8956 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1569.7541 | 3.6346 | -46.517 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6207 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.6207 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7391 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.7391 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C5 | 5974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.315 |
| Bottom | 3054 | 0.62 | 0.316 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1801.9432 | 53.3976 | -0.7974 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1813.516 | 53.7405 | 4.5923 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5764 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.5764 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3084 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.3084 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C6 | 5975 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.268 |
| Bottom | 3054 | 0.62 | 0.271 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1534.7609 | 45.4801 | 1.1527 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1569.4794 | 46.5089 | 8.7231 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0377 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.0377 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6143 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6143 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C7 | 5976 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.326 |
| Bottom | 3054 | 0.62 | 0.33 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1876.8106 | 55.6162 | 5.9946 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1888.3835 | 55.9591 | -1.4942 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8044 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.8044 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2991 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.2991 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C8 | 5977 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.275 |
| Bottom | 3054 | 0.62 | 0.277 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1571.2945 | 0.9973 | 46.5627 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1582.8673 | 46.9056 | -1.7989 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5781 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.5781 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6476 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.6476 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C9 | 5978 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.46 |
| Bottom | 3360 | 0.93 | 0.465 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2095.58 | 55.1138 | 3.2469 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2121.0874 | 3.4202 | 55.7846 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.0781 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.0781 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6587 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6587 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C10 | 5979 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.546 |
| Bottom | 3360 | 0.93 | 0.552 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2481.9229 | 65.2746 | 1.9825 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2507.4304 | 0.3356 | 65.9454 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7385 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.7385 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2589 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.2589 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C11 | 5980 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.393 |
| Bottom | 3360 | 0.93 | 0.4 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1789.127 | -47.054 | 2.5149 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1814.6345 | -47.7249 | 0.9648 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.1763 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.1763 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.1279 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.1279 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C12 | 5981 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.415 |
| Bottom | 3360 | 0.93 | 0.42 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1884.9065 | -49.573 | 1.6495 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1910.414 | -0.4959 | 50.2439 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.198 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.198 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6777 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6777 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C13 | 6210 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.53 |
| Bottom | 2036 | 0.85 | 0.532 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1529.1001 | -30.582 | 62.3741 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1552.943 | 31.0589 | 6.4028 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.4912 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 21.4912 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7266 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.7266 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C14 | 6212 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.209 |
| Bottom | 2036 | 0.85 | 0.238 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 615.6552 | -12.3131 | 5.2247 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 630.2309 | -21.8937 | 20.2094 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.112 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.112 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.4416 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.4416 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C15 | 6215 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.429 |
| Bottom | 2036 | 0.85 | 0.422 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1212.6548 | 24.2531 | 59.5548 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1236.4978 | -24.73 | 6.823 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.1787 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.1787 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.4918 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.4918 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C16 | 6217 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.427 |
| Bottom | 2036 | 0.85 | 0.423 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1214.0101 | -24.2802 | 57.3779 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1237.8531 | 24.7571 | 6.9276 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.2811 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.2811 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.2011 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.2011 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C18 | 6219 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.206 |
| Bottom | 2036 | 0.85 | 0.237 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 606.377 | -12.1275 | -5.8888 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 620.9527 | -22.5604 | -19.9119 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.2721 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.2721 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5828 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.5828 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C17 | 6222 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.387 |
| Bottom | 2036 | 0.85 | 0.413 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1139.4873 | 22.7897 | 12.2403 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1153.7931 | 31.5101 | -36.8829 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.8013 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.8013 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 13.7841 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 13.7841 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C20 | 6225 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.525 |
| Bottom | 2036 | 0.85 | 0.532 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1526.3338 | 30.5267 | 56.8882 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1550.1767 | -31.0035 | 4.8728 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.849 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.849 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.2025 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.2025 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C19 | 6227 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.4 |
| Bottom | 2036 | 0.85 | 0.416 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1174.1744 | -23.4835 | 18.1506 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 1193.2488 | -28.0848 | -38.1442 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.0513 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.0513 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.5732 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.5732 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C21 | 6230 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.534 |
| Bottom | 2036 | 0.85 | 0.543 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1551.4133 | -31.0283 | -58.2855 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1575.2563 | 31.5051 | -1.4847 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.9415 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.9415 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.5814 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.5814 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C22 | 6232 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.202 |
| Bottom | 2036 | 0.85 | 0.242 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 594.6276 | 11.8926 | 6.7095 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 609.2033 | 25.508 | 19.5351 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.3376 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.3376 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.1825 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.1825 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C23 | 6235 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.424 |
| Bottom | 2036 | 0.85 | 0.423 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1210.2591 | 24.2052 | -54.2318 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1234.1021 | -24.682 | -4.3251 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.5298 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 18.5298 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.8673 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.8673 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C24 | 6237 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.235 |
| Bottom | 2036 | 0.85 | 0.267 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 691.1807 | 13.8236 | -7.3671 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 705.7564 | 24.6043 | -22.6313 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.8755 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.8755 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.9277 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.9277 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C25 | 6241 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.42 |
| Bottom | 2036 | 0.85 | 0.423 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1208.7562 | -24.1751 | -50.1541 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1232.5992 | 24.652 | -4.5529 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.9469 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.9469 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.6377 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.6377 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C26 | 6243 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.525 |
| Bottom | 2036 | 0.85 | 0.533 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1523.1993 | 30.464 | -57.1225 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1547.0423 | -30.9408 | -2.9736 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.0999 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.0999 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.5854 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.5854 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C27 | 6258 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.393 |
| Bottom | 2036 | 0.85 | 0.412 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1156.5022 | -23.13 | -9.3488 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1170.8079 | -29.0277 | 37.4268 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.8487 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.8487 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.8938 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.8938 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C28 | 6262 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.399 |
| Bottom | 2036 | 0.85 | 0.418 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1176.874 | 23.5375 | -9.4699 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1191.1798 | 29.3937 | 38.078 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.7865 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.7865 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.9478 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.9478 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C29 | 6266 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.368 |
| Bottom | 2036 | 0.85 | 0.378 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1082.7846 | 21.6557 | 13.8235 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1097.0903 | 24.0495 | 35.0703 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.7225 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.7225 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4178 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.4178 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C30 | 6268 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.374 |
| Bottom | 2036 | 0.85 | 0.381 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1100.406 | -22.0081 | 13.5587 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1114.7118 | -22.3196 | 35.6336 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.4065 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.4065 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.7127 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.7127 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C31 | 6270 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.418 |
| Bottom | 2036 | 0.85 | 0.428 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1231.8198 | 24.6364 | -14.2697 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1246.1256 | 26.0332 | -5.2607 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.3336 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.3336 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.1802 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 12.1802 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C32 | 6272 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.409 |
| Bottom | 2036 | 0.85 | 0.415 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1201.6308 | -24.0326 | -16.5428 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1215.9365 | -24.3187 | -6.3966 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.1687 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.1687 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.5643 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.5643 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C33 | 6274 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.567 |
| Bottom | 3054 | 1.02 | 0.579 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2175.8084 | -43.5162 | -22.468 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 2187.7299 | -43.7546 | 2.5002 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.9495 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 22.9495 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 14.1072 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 14.1072 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C35 | 6280 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.491 |
| Bottom | 3054 | 1.02 | 0.504 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1890.3024 | 37.806 | -22.2063 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1902.2238 | 38.0445 | 0.8045 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.2491 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 21.2491 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.3492 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 11.3492 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C34 | 6282 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.449 |
| Bottom | 3054 | 1.02 | 0.461 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1726.1344 | -34.5227 | 18.5507 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1738.0559 | -34.7611 | 0.3267 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.5526 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.5526 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 12.4945 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 12.4945 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C36 | 6286 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.477 |
| Bottom | 3054 | 1.02 | 0.49 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1836.7778 | 36.7356 | 22.6324 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1848.6993 | 36.974 | 1.2623 | 530 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.4747 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.4747 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 12.1645 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 12.1645 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C37 | 6290 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.614 |
| Bottom | 2036 | 0.85 | 0.623 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1802.7378 | -36.0548 | 31.8472 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1817.0436 | -36.3409 | 7.1785 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.8816 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.8816 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.5502 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.5502 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C38 | 6293 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.627 |
| Bottom | 2036 | 0.85 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1839.7727 | 36.7955 | 30.6886 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1854.0785 | 37.0816 | 5.89 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.8706 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.8706 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.6938 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.6938 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C39 | 6296 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.251 |
| Bottom | 4196 | 0.75 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1682.049 | -33.641 | -4.9184 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1715.4291 | -34.3086 | -11.0544 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.7322 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 3.7322 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 14.5953 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 14.5953 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C40 | 6298 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.264 |
| Bottom | 4196 | 0.75 | 0.27 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1764.9231 | 35.2985 | -4.9498 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1798.3033 | 42.8347 | -11.3966 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.9078 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 3.9078 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 19.3106 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 19.3106 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C41 | 6300 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.248 |
| Bottom | 4196 | 0.75 | 0.252 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1662.9256 | -33.2585 | 3.9143 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1696.3058 | -33.9261 | 10.7826 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.3963 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.3963 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 14.286 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 14.286 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C42 | 6302 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.255 |
| Bottom | 4196 | 0.75 | 0.259 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1703.2338 | 34.0647 | 3.32 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1736.614 | 37.9789 | 10.461 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.5806 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.5806 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 17.7409 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 17.7409 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C43 | 6304 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.823 |
| Bottom | 2036 | 0.85 | 0.838 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2417.8275 | 48.3565 | -36.2444 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 2436.9019 | -48.738 | -5.2904 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.9112 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 13.9112 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.2324 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.2324 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C44 | 6306 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.632 |
| Bottom | 2036 | 0.85 | 0.643 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1855.2545 | 37.1051 | -29.9148 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1869.5602 | 37.3912 | -4.001 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 15.8418 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 15.8418 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.9663 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.9663 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C1 | 6325 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.108 |
| Bottom | 3054 | 0.62 | 0.116 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 629.0047 | 18.6395 | -5.7226 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 663.7232 | 20.84 | 19.6683 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.003 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.003 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0607 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.0607 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C2 | 6326 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.118 |
| Bottom | 3054 | 0.62 | 0.125 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 680.4738 | 20.1647 | -3.469 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 715.1923 | -21.1935 | 1.5867 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7575 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7575 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2825 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2825 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C3 | 6327 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.108 |
| Bottom | 3054 | 0.62 | 0.114 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 619.7801 | 1.6622 | 18.3661 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 654.4986 | 16.6393 | -19.395 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.114 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.114 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7803 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7803 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C4 | 6328 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.115 |
| Bottom | 3054 | 0.62 | 0.119 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 659.1224 | 19.532 | 1.509 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 693.8409 | -4.8236 | -20.5608 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6078 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.6078 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1048 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.1048 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C5 | 6329 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.105 |
| Bottom | 3054 | 0.62 | 0.112 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 612.1396 | 4.5713 | -18.1397 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 646.8581 | -3.3254 | 19.1686 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.25 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 9.25 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3871 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.3871 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C6 | 6330 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.114 |
| Bottom | 3054 | 0.62 | 0.12 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 657.4527 | 19.4825 | -2.6404 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 692.1712 | 13.8216 | 20.5113 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.009 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.009 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3326 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.3326 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C7 | 6331 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.113 |
| Bottom | 3054 | 0.62 | 0.119 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 621.2687 | 23.7719 | 26.4036 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 679.1329 | -24.5537 | -20.125 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7126 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 13.7126 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.4926 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.4926 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C8 | 6332 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.116 |
| Bottom | 3054 | 0.62 | 0.122 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 670.1416 | 2.098 | 19.8585 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 704.8601 | 14.4889 | -20.8874 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1407 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.1407 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3875 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.3875 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C9 | 6333 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.322 |
| Bottom | 2688 | 0.75 | 0.327 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1397.8095 | 2.0118 | 36.7624 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1423.317 | -37.4332 | 3.145 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.1227 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.1227 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7983 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.7983 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C10 | 6334 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.444 |
| Bottom | 2688 | 0.75 | 0.446 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1922.6347 | 50.5653 | 1.0548 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1931.1372 | -1.0844 | 50.7889 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1767 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.1767 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.111 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 12.111 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C11 | 6335 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.24 |
| Bottom | 2688 | 0.75 | 0.248 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1045.2508 | -27.4901 | 1.8463 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1070.7582 | 28.1609 | -0.0746 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2775 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2775 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0488 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.0488 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C12 | 6336 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.273 |
| Bottom | 2688 | 0.75 | 0.276 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1182.6024 | -31.1024 | 0.2759 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1191.1049 | 0.1549 | 31.3261 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.0191 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.0191 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.1705 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.1705 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C13 | 6565 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.236 |
| Bottom | 1609 | 0.67 | 0.29 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 579.4774 | -11.5895 | 49.1055 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 603.3203 | 16.5896 | -79.6018 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.7627 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 48.7627 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0475 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.0475 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C14 | 6567 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.087 |
| Bottom | 1609 | 0.67 | 0.099 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 243.311 | 4.8662 | -4.975 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 257.8867 | 5.1577 | -15.9923 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.7657 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.7657 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3262 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3262 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C15 | 6570 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.219 |
| Bottom | 1609 | 0.67 | 0.247 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 467.4478 | 9.349 | 61.9119 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 491.2907 | -9.8258 | -77.7715 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.8534 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 52.8534 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2479 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.2479 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C16 | 6572 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.199 |
| Bottom | 1609 | 0.67 | 0.243 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 452.4365 | -9.0487 | 50.7103 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 476.2794 | 9.5256 | -77.9873 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.6744 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 48.6744 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.7909 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.7909 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C18 | 6574 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.085 |
| Bottom | 1609 | 0.67 | 0.091 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 237.5704 | 4.7514 | 1.8302 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 252.1461 | 5.0429 | 8.9245 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.4167 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.4167 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1552 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1552 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C17 | 6577 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.151 |
| Bottom | 1609 | 0.67 | 0.149 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 425.857 | -8.5171 | 37.3361 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 449.6999 | 8.994 | -27.8271 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.7382 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 24.7382 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.9106 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.9106 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C20 | 6580 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.229 |
| Bottom | 1609 | 0.67 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 580.9381 | 11.6188 | 41.5437 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 604.7811 | -15.9011 | -79.5623 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.8001 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 45.8001 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.0445 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.0445 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C19 | 6582 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.152 |
| Bottom | 1609 | 0.67 | 0.158 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 440.7888 | 8.8158 | 33.6119 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 464.6318 | -9.2926 | -33.0528 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.2381 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.2381 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4834 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.4834 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C21 | 6585 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.236 |
| Bottom | 1609 | 0.67 | 0.311 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 592.3303 | -11.8466 | -44.7905 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 616.1733 | 15.6049 | 94.1923 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.2066 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 52.2066 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.6315 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.6315 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C22 | 6587 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.085 |
| Bottom | 1609 | 0.67 | 0.095 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 237.8319 | 4.7566 | -3.1432 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 252.4076 | 5.0482 | -12.8158 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.9769 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.9769 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0872 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0872 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C23 | 6590 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.196 |
| Bottom | 1609 | 0.67 | 0.263 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 457.9735 | 9.1595 | -46.4954 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 481.8165 | -9.6363 | 88.7734 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.8898 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 50.8898 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.355 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.355 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C24 | 6592 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.101 |
| Bottom | 1609 | 0.67 | 0.116 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 280.297 | 5.6059 | 7.8991 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 294.8727 | 5.8975 | 21.3195 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.2809 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 8.2809 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0512 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0512 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C25 | 6596 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.214 |
| Bottom | 1609 | 0.67 | 0.258 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 501.0415 | -10.0208 | -50.9926 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 524.8844 | 10.4977 | 78.8533 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.8652 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 48.8652 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.0527 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.0527 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C26 | 6598 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.234 |
| Bottom | 1609 | 0.67 | 0.298 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 597.8653 | 11.9573 | -41.571 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 621.7082 | -14.5809 | 84.8272 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.5541 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 47.5541 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5095 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 8.5095 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C27 | 6600 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.153 |
| Bottom | 1609 | 0.67 | 0.164 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 440.1435 | 8.8029 | -35.462 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 463.9865 | -9.2797 | 39.8931 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.3353 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 28.3353 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6592 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.6592 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C28 | 6604 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.156 |
| Bottom | 1609 | 0.67 | 0.176 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 448.2182 | -8.9644 | -36.2666 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 472.0612 | 9.4412 | 48.8117 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.9283 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 31.9283 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.3708 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.3708 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C29 | 6608 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.146 |
| Bottom | 1609 | 0.67 | 0.155 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 404.8867 | -8.0977 | 0.3197 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 419.1925 | 8.3839 | -18.4718 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 11.973 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 11.973 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.68 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.68 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C30 | 6610 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.148 |
| Bottom | 1609 | 0.67 | 0.166 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 414.4204 | -8.2884 | -2.2098 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 428.7262 | -8.5745 | -28.3399 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.5254 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.5254 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.6062 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.6062 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C31 | 6612 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.167 |
| Bottom | 1609 | 0.67 | 0.203 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 453.5202 | -9.0704 | -19.9187 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 477.3631 | 9.5473 | 47.4534 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.2592 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.2592 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.9569 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.9569 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C32 | 6614 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.165 |
| Bottom | 1609 | 0.67 | 0.193 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 438.6855 | 8.7737 | -23.2945 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 462.5285 | -9.2506 | 43.3104 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.0465 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.0465 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.5058 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.5058 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C33 | 6616 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.434 |
| Bottom | 2545 | 0.85 | 0.444 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1577.3177 | 31.5464 | 4.7853 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1595.2 | -31.904 | 82.8851 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.635 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 48.635 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.182 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.182 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C35 | 6622 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.367 |
| Bottom | 2545 | 0.85 | 0.381 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1338.3241 | -26.7665 | 6.5837 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1356.2063 | 27.1241 | 76.4375 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.6019 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 43.6019 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.5569 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.5569 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C34 | 6624 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.315 |
| Bottom | 2545 | 0.85 | 0.319 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1148.0604 | 22.9612 | 6.0515 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1165.9426 | -23.3189 | -35.7418 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.64 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 26.64 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.1887 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.1887 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C36 | 6628 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.363 |
| Bottom | 2545 | 0.85 | 0.366 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1318.4014 | -26.368 | 4.1671 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1336.2837 | 26.7257 | -56.6129 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.5529 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 38.5529 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.8844 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.8844 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C37 | 6632 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.239 |
| Bottom | 1609 | 0.67 | 0.274 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 629.4832 | 12.5897 | 35.7417 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 653.3261 | -13.0665 | -61.9777 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.0854 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 37.0854 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.0347 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.0347 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C38 | 6635 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.242 |
| Bottom | 1609 | 0.67 | 0.283 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 648.7856 | -12.9757 | 31.7338 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 672.6286 | 13.4526 | -65.0204 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.6599 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 36.6599 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.9719 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.9719 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C39 | 6638 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.115 |
| Bottom | 3663 | 0.65 | 0.119 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 757.4589 | 15.1492 | 6.4079 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 790.8391 | -15.8168 | 13.9055 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.7608 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.7608 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.4961 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 10.4961 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C40 | 6640 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.125 |
| Bottom | 3663 | 0.65 | 0.13 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 820.973 | 16.4195 | 4.811 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 854.3531 | 18.5174 | 44.3979 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.5408 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.5408 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.0729 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 10.0729 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C41 | 6642 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.115 |
| Bottom | 3663 | 0.65 | 0.119 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 749.2179 | 14.9844 | -3.2169 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 782.598 | -15.652 | -8.9069 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.5343 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 3.5343 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.1414 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 10.1414 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C42 | 6644 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.119 |
| Bottom | 3663 | 0.65 | 0.123 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 777.8066 | 15.5561 | -4.7595 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 811.1868 | 16.6699 | -42.1547 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.3593 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 4.3593 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.2842 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 10.2842 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C43 | 6646 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.474 |
| Bottom | 1609 | 0.67 | 0.503 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1297.5866 | -25.9517 | -50.8775 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1321.4295 | -26.4286 | 76.6699 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.6895 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 47.6895 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.0414 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.0414 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C44 | 6648 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.247 |
| Bottom | 1609 | 0.67 | 0.296 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 660.7282 | -13.2146 | -32.6769 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 684.5712 | 13.6914 | 72.2332 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 39.4315 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 39.4315 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.18 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.18 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C1 | 6667 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.181 |
| Bottom | 3054 | 0.62 | 0.185 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1036.9804 | 0.8051 | -30.7292 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1071.6988 | 20.4978 | 31.758 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8674 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.8674 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1071 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.1071 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C2 | 6668 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.172 |
| Bottom | 3054 | 0.62 | 0.177 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 983.8858 | 29.1558 | -1.4462 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1018.6043 | -30.1846 | 3.577 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.77 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.77 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2561 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.2561 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C3 | 6669 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.179 |
| Bottom | 3054 | 0.62 | 0.182 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1022.1636 | -30.2901 | 1.0538 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1056.8821 | 15.6737 | -31.3189 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5352 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.5352 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6761 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.6761 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C4 | 6670 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.167 |
| Bottom | 3054 | 0.62 | 0.171 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 953.4847 | 28.2549 | -0.564 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 988.2032 | -5.5756 | -29.2838 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4507 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.4507 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4598 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.4598 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C5 | 6671 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.177 |
| Bottom | 3054 | 0.62 | 0.181 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1009.8288 | 29.9246 | -0.2229 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1044.5473 | -3.8994 | 30.9534 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2234 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2234 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2378 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.2378 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C6 | 6672 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.166 |
| Bottom | 3054 | 0.62 | 0.17 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 951.6101 | 28.1994 | 1.3849 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 986.3286 | 29.2282 | 5.663 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2709 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2709 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9254 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.9254 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C7 | 6673 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.182 |
| Bottom | 3054 | 0.62 | 0.189 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1056.1015 | 31.2958 | 5.9457 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1090.82 | -23.3731 | -32.3246 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.817 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.817 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.2589 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 17.2589 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C8 | 6674 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.17 |
| Bottom | 3054 | 0.62 | 0.174 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 973.2933 | 0.3008 | 28.8419 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1008.0118 | 16.1037 | -29.8707 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9668 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.9668 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.132 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.132 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C9 | 6675 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.375 |
| Bottom | 2688 | 0.75 | 0.381 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1626.6369 | 1.4457 | 42.7806 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1652.1444 | -43.4514 | 2.3056 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.829 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.829 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.1317 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.1317 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C10 | 6676 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.484 |
| Bottom | 2688 | 0.75 | 0.485 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2095.7121 | 55.1172 | 1.4645 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2104.2146 | -2.9496 | 55.3408 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.8692 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.8692 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5494 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.5494 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C11 | 6677 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.298 |
| Bottom | 2688 | 0.75 | 0.305 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1291.593 | -0.592 | 33.9689 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1317.1004 | 34.6397 | -0.3516 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.5888 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.5888 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3948 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.3948 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C12 | 6678 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.326 |
| Bottom | 2688 | 0.75 | 0.328 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1411.7323 | -37.1286 | 0.9245 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1437.2397 | 37.7994 | 6.3107 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.5204 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.5204 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.6001 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.6001 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C13 | 6907 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.349 |
| Bottom | 1609 | 0.67 | 0.377 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 894.9845 | -17.8997 | 61.3124 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 918.8275 | 18.3765 | -80.8277 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.9162 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 53.9162 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.3428 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.3428 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C14 | 6909 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.133 |
| Bottom | 1609 | 0.67 | 0.141 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 368.7716 | 7.3754 | -0.6634 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 383.3473 | 7.6669 | -16.2052 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.5448 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 9.5448 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3386 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3386 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C15 | 6912 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.288 |
| Bottom | 1609 | 0.67 | 0.32 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 711.8952 | 14.2379 | 58.421 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 735.7382 | -14.7148 | -79.1089 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.094 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 52.094 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.4222 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.4222 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C16 | 6914 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.284 |
| Bottom | 1609 | 0.67 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 703.0565 | -14.0611 | 57.6489 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 726.8994 | 14.538 | -79.5835 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.9446 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 51.9446 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.5939 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.5939 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C18 | 6916 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.13 |
| Bottom | 1609 | 0.67 | 0.135 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 361.6415 | 7.2328 | -0.9883 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 376.2172 | -7.5243 | 8.6015 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.9747 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.9747 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3175 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.3175 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C17 | 6919 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.207 |
| Bottom | 1609 | 0.67 | 0.216 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 670.071 | 13.4014 | 2.0786 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 684.3768 | 13.6875 | -26.1583 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.9744 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.9744 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2089 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.2089 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C20 | 6922 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.344 |
| Bottom | 1609 | 0.67 | 0.376 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 895.4837 | 17.9097 | 55.9646 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 919.3267 | -18.3865 | -79.3142 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.2056 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 51.2056 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.3516 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.3516 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C19 | 6924 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.215 |
| Bottom | 1609 | 0.67 | 0.225 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 693.3957 | -13.8679 | -0.5742 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 707.7015 | -14.154 | -29.8656 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.5528 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 18.5528 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.723 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.723 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C21 | 6927 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.35 |
| Bottom | 1609 | 0.67 | 0.396 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 911.8844 | -18.2377 | -55.8611 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 935.7274 | 18.7145 | 92.1701 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.5383 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 55.5383 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.118 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.118 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C22 | 6929 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.129 |
| Bottom | 1609 | 0.67 | 0.134 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 358.0236 | 7.1605 | 0.7335 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 372.5993 | 7.452 | -12.0217 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.8827 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.8827 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1014 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1014 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C23 | 6932 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.282 |
| Bottom | 1609 | 0.67 | 0.33 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 706.3788 | 14.1276 | -54.473 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 730.2218 | -14.6044 | 87.7009 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.4384 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 53.4384 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.23 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.23 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C24 | 6934 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.15 |
| Bottom | 1609 | 0.67 | 0.162 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 418.7142 | 8.3743 | 1.6866 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 433.2899 | 8.6658 | 21.121 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 12.0001 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 12.0001 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1458 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1458 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C25 | 6938 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.287 |
| Bottom | 1609 | 0.67 | 0.326 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 733.9801 | -14.6796 | -50.3775 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 757.8231 | 15.1565 | 78.4527 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.4328 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 48.4328 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.0954 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.0954 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C26 | 6940 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.348 |
| Bottom | 1609 | 0.67 | 0.384 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 905.8685 | 18.1174 | -56.1095 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 929.7114 | -18.5942 | 84.1981 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.7495 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 52.7495 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.4282 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.4282 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C27 | 6942 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.212 |
| Bottom | 1609 | 0.67 | 0.227 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 681.0347 | 13.6207 | -8.5296 | 2120 | 201] 1.5 [DL + LL] |
| Bottom | 700.109 | -14.0022 | 36.1659 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.9416 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.9416 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.0675 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.0675 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C28 | 6946 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.217 |
| Bottom | 1609 | 0.67 | 0.236 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 698.63 | 13.9726 | 6.076 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 712.9358 | 14.2587 | 43.389 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.2356 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 23.2356 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.8199 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.8199 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C29 | 6950 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.226 |
| Bottom | 1609 | 0.67 | 0.232 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 620.2355 | -12.4047 | 23.9753 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 644.0785 | 12.8816 | -21.6879 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.441 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 17.441 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.255 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.255 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C30 | 6952 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.231 |
| Bottom | 1609 | 0.67 | 0.243 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 642.9391 | -12.8588 | 2.5631 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 657.2449 | -13.1449 | -29.619 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.3692 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.3692 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.059 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.059 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C31 | 6954 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.26 |
| Bottom | 1609 | 0.67 | 0.283 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 711.425 | -14.2285 | -28.0902 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 735.268 | 14.7054 | 46.2544 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.8183 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.8183 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.6333 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.6333 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C32 | 6956 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.255 |
| Bottom | 1609 | 0.67 | 0.274 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 690.0412 | 13.8008 | -30.5515 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 713.8841 | -14.2777 | 43.6462 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.8644 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.8644 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.001 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.001 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C33 | 6958 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.488 |
| Bottom | 2545 | 0.85 | 0.491 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1772.7457 | -35.4549 | 4.6896 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1790.6279 | -35.8126 | 79.2403 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.3881 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 46.3881 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.4997 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.4997 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C35 | 6964 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.419 |
| Bottom | 2545 | 0.85 | 0.424 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1516.4317 | 30.3286 | 1.672 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1534.3139 | 30.6863 | 73.0787 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.5546 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 44.5546 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.1148 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.1148 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C34 | 6966 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.366 |
| Bottom | 2545 | 0.85 | 0.371 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1336.0815 | -26.7216 | 7.4303 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1353.9637 | -27.0793 | -35.9776 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.6749 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.6749 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.7117 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.7117 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C36 | 6970 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.408 |
| Bottom | 2545 | 0.85 | 0.411 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1484.9111 | 29.6982 | 5.2284 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1502.7933 | 30.0559 | -53.5305 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 37.2992 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 37.2992 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.5988 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.5988 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C37 | 6974 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.382 |
| Bottom | 1609 | 0.67 | 0.398 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1015.4247 | 20.3085 | 53.4829 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1039.2676 | -20.7854 | -63.4081 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.4102 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 44.4102 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6359 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.6359 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C38 | 6977 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.389 |
| Bottom | 1609 | 0.67 | 0.409 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1040.9376 | -20.8188 | 52.2615 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1064.7805 | 21.2956 | -66.4506 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.0159 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 45.0159 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6068 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.6068 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C39 | 6980 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.163 |
| Bottom | 3663 | 0.65 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1067.3624 | 21.3472 | 3.9954 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1100.7425 | -22.0149 | 15.725 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.4448 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 7.4448 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 9.5259 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 9.5259 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C40 | 6982 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.174 |
| Bottom | 3663 | 0.65 | 0.178 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1138.3123 | 22.7662 | 3.1785 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1171.6924 | 23.4338 | 13.9437 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.853 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 6.853 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.5281 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 10.5281 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C41 | 6984 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.162 |
| Bottom | 3663 | 0.65 | 0.165 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1055.1414 | 21.1028 | -1.1686 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1088.5215 | -21.7704 | -13.5513 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.7257 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 7.7257 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 9.5045 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 9.5045 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C42 | 6986 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.167 |
| Bottom | 3663 | 0.65 | 0.17 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1087.6929 | 21.7539 | -2.7268 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1121.073 | 22.4215 | -15.7458 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.1138 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 8.1138 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 9.6411 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 9.6411 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C43 | 6988 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.604 |
| Bottom | 1609 | 0.67 | 0.621 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1674.8741 | 33.4975 | 1.998 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1689.1798 | -33.7836 | 71.6823 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.3266 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 43.3266 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.985 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.985 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C44 | 6990 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.393 |
| Bottom | 1609 | 0.67 | 0.42 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1054.2196 | -21.0844 | -51.3859 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1078.0625 | 21.5613 | 72.8161 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.6272 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 46.6272 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.7748 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.7748 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C1 | 7009 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.252 |
| Bottom | 3054 | 0.62 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1443.315 | 42.7702 | -2.6323 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1478.0335 | 25.6984 | 43.7991 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9445 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.9445 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7588 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.7588 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C2 | 7010 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.225 |
| Bottom | 3054 | 0.62 | 0.23 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1283.5327 | 38.0354 | -0.8004 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1318.2512 | -39.0642 | 2.4996 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8915 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.8915 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5971 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5971 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C3 | 7011 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.249 |
| Bottom | 3054 | 0.62 | 0.251 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1423.3 | 42.1771 | 0.2452 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1458.0185 | 21.6762 | -43.2059 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7637 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.7637 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.7954 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.7954 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C4 | 7012 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.218 |
| Bottom | 3054 | 0.62 | 0.221 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1245.1436 | 36.8978 | -1.4236 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1279.8621 | -37.9266 | -6.7912 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7034 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.7034 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.907 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.907 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C5 | 7013 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.246 |
| Bottom | 3054 | 0.62 | 0.248 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1406.3638 | 41.6752 | -1.0449 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1417.9366 | -0.9344 | 42.0182 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9152 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9152 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.165 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 10.165 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C6 | 7014 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.218 |
| Bottom | 3054 | 0.62 | 0.223 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1243.8848 | 36.8605 | 0.5426 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1278.6033 | 37.8893 | 2.5197 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.0661 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 1.0661 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7995 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 3.7995 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C7 | 7015 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.255 |
| Bottom | 3054 | 0.62 | 0.26 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1466.8298 | 5.2371 | 43.4671 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1501.5483 | -34.1687 | -44.4959 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.0337 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.0337 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 21.1616 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 21.1616 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C8 | 7016 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.223 |
| Bottom | 3054 | 0.62 | 0.226 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1273.4501 | 1.0218 | 37.7366 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1308.1686 | 38.7654 | -7.761 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9726 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.9726 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1412 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 7.1412 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C9 | 7017 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.409 |
| Bottom | 3360 | 0.93 | 0.415 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1858.8909 | 0.5576 | 48.8888 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1884.3984 | -49.5597 | 1.6898 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.899 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.899 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.4155 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.4155 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C10 | 7018 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.503 |
| Bottom | 3360 | 0.93 | 0.503 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2282.3545 | 60.0259 | 0.5882 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 2290.857 | -60.2495 | 2.7877 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8823 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.8823 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.2105 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.2105 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C11 | 7019 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.338 |
| Bottom | 3360 | 0.93 | 0.345 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1539.1978 | -1.0883 | 40.4809 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1564.7052 | 41.1517 | -0.1012 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4331 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4331 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.7354 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 6.7354 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C12 | 7020 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.363 |
| Bottom | 3360 | 0.93 | 0.365 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1645.8123 | -43.2849 | 0.1859 | 1890 | 201] 1.5 [DL + LL] |
| Bottom | 1671.3197 | 43.9557 | 4.0563 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6857 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.6857 | 1260 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.0113 | 3150 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.0113 | 1260 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C13 | 7249 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.429 |
| Bottom | 2036 | 0.85 | 0.472 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1211.7594 | -24.2352 | 60.9107 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1235.6024 | 24.712 | -99.8703 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.0329 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 61.0329 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.3522 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.3522 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C14 | 7251 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.17 |
| Bottom | 2036 | 0.85 | 0.173 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 493.0785 | 9.8616 | -0.5871 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 507.6542 | 10.1531 | -12.6182 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.3682 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.3682 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.9184 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.9184 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C15 | 7254 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.349 |
| Bottom | 2036 | 0.85 | 0.4 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 960.3813 | 19.2076 | 59.1606 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 984.2242 | -19.6845 | -102.3788 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.2165 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 61.2165 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2392 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.2392 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C16 | 7256 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.347 |
| Bottom | 2036 | 0.85 | 0.399 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 957.0363 | -19.1407 | 57.526 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 980.8792 | 19.6176 | -102.6631 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 60.6669 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 60.6669 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2254 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.2254 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C18 | 7258 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.166 |
| Bottom | 2036 | 0.85 | 0.17 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 484.7475 | 9.6949 | -2.196 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 499.3231 | 9.9865 | 3.8968 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.8306 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.8306 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.9959 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.9959 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C17 | 7261 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.31 |
| Bottom | 2036 | 0.85 | 0.313 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 903.8465 | -18.0769 | 3.054 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 918.1523 | -18.363 | -26.1136 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.611 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 18.611 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8453 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.8453 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C20 | 7264 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.425 |
| Bottom | 2036 | 0.85 | 0.468 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1210.7815 | 24.2156 | 55.4345 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1234.6245 | -24.6925 | -96.3072 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 57.4811 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 57.4811 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.5613 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.5613 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C19 | 7266 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.323 |
| Bottom | 2036 | 0.85 | 0.324 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 935.3721 | 18.7074 | 0.6046 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 949.6779 | 18.9936 | -29.4035 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.0431 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.0431 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.655 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.655 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C21 | 7269 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.431 |
| Bottom | 2036 | 0.85 | 0.486 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1231.7111 | -24.6342 | -55.4372 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1255.5541 | 25.1111 | 107.3323 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.0462 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 61.0462 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4363 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 11.4363 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C22 | 7271 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.164 |
| Bottom | 2036 | 0.85 | 0.168 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 477.1551 | -9.5431 | 1.3615 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 491.7308 | -9.8346 | -8.6773 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.2075 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.2075 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3812 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.3812 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C23 | 7274 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.344 |
| Bottom | 2036 | 0.85 | 0.406 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 957.1326 | 19.1427 | -53.923 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 980.9755 | -19.6195 | 108.2907 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 60.9687 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 60.9687 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.844 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.844 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C24 | 7276 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.191 |
| Bottom | 2036 | 0.85 | 0.194 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 555.8232 | -11.1165 | 1.3481 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 570.3989 | -11.408 | 17.0782 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.7264 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 9.7264 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3273 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.3273 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C25 | 7280 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.345 |
| Bottom | 2036 | 0.85 | 0.398 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 969.943 | -19.3989 | -50.2156 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 993.786 | 19.8757 | 98.6441 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.9642 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 55.9642 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.7728 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.7728 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C26 | 7282 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.426 |
| Bottom | 2036 | 0.85 | 0.474 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1214.4813 | 24.2896 | -55.4258 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1238.3243 | -24.7665 | 100.8273 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 58.7277 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 58.7277 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.3216 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.3216 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C27 | 7284 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.317 |
| Bottom | 2036 | 0.85 | 0.322 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 920.5202 | 18.4104 | 1.1127 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 934.8259 | 18.6965 | 34.6246 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.901 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.901 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.9147 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.9147 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C28 | 7288 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.321 |
| Bottom | 2036 | 0.85 | 0.331 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 937.3814 | -18.7476 | 3.7309 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 951.6871 | -19.0337 | 39.5588 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.254 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 22.254 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5811 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.5811 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C29 | 7292 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.295 |
| Bottom | 2036 | 0.85 | 0.304 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 856.6244 | -17.1325 | -1.2063 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 870.9302 | 17.4186 | -37.696 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.2187 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 23.2187 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.11 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.11 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C30 | 7294 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.299 |
| Bottom | 2036 | 0.85 | 0.313 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 872.3983 | 17.448 | -3.7109 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 886.7041 | -17.7341 | -43.6338 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.289 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 25.289 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.1609 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.1609 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C31 | 7296 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.332 |
| Bottom | 2036 | 0.85 | 0.361 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 977.9506 | -19.559 | 8.456 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 992.2564 | 19.8451 | 61.2364 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 32.9244 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 32.9244 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.2652 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.2652 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C32 | 7298 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.324 |
| Bottom | 2036 | 0.85 | 0.351 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 951.5099 | 19.0302 | 6.0855 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 965.8157 | -19.3163 | 59.0082 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 33.1287 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 33.1287 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.1592 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.1592 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C33 | 7300 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.52 |
| Bottom | 3054 | 1.02 | 0.52 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1972.2355 | 39.4447 | 6.3197 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1990.1177 | -39.8024 | 81.4291 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.7353 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 46.7353 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.4054 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.4054 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C35 | 7306 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.449 |
| Bottom | 3054 | 1.02 | 0.45 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1700.5174 | -34.0103 | 3.9638 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1718.3997 | 34.368 | 73.9702 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 43.6611 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 43.6611 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.5266 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.5266 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C34 | 7308 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.403 |
| Bottom | 3054 | 1.02 | 0.404 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1528.8808 | 30.5776 | 6.4505 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1534.8415 | 30.6968 | -7.5636 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.8184 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 26.8184 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.9433 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.9433 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C36 | 7312 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.438 |
| Bottom | 3054 | 1.02 | 0.437 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1657.8015 | -33.156 | 4.1086 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1675.6837 | 33.5137 | -52.6427 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.0535 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 36.0535 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.8291 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 1.8291 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C37 | 7316 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.486 |
| Bottom | 2036 | 0.85 | 0.515 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1412.546 | 28.2509 | -3.2321 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1426.8517 | -28.537 | -83.8832 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.1329 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 51.1329 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6178 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.6178 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C38 | 7319 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.495 |
| Bottom | 2036 | 0.85 | 0.527 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1443.9451 | -28.8789 | -5.1563 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1458.2509 | 29.165 | -86.5905 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.5386 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 51.5386 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4791 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.4791 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C39 | 7322 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.205 |
| Bottom | 4196 | 0.75 | 0.207 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1375.6789 | 27.5136 | 8.5606 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1409.059 | -28.1812 | 23.6983 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 9.6176 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 9.6176 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 8.6442 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 8.6442 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C40 | 7324 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.216 |
| Bottom | 4196 | 0.75 | 0.219 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1453.0769 | -29.0615 | 7.9336 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1486.4571 | 29.7291 | 22.3695 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 9.1934 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 9.1934 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 7.8082 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 7.8082 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C41 | 7326 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.202 |
| Bottom | 4196 | 0.75 | 0.205 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1359.846 | 27.1969 | -8.2708 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1393.2261 | -27.8645 | -23.6226 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 9.5841 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 9.5841 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 8.5669 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 8.5669 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C42 | 7328 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.208 |
| Bottom | 4196 | 0.75 | 0.21 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1396.3042 | -27.9261 | -9.7879 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1429.6844 | 28.5937 | -26.4421 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 10.3904 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 10.3904 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 7.579 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 7.579 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C43 | 7330 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.7 |
| Bottom | 2036 | 0.85 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2046.4096 | 40.9282 | 9.6441 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 2060.7154 | -41.2143 | 93.4882 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.2103 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 52.2103 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7448 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.7448 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C44 | 7332 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.498 |
| Bottom | 2036 | 0.85 | 0.537 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1458.4092 | -29.1682 | 7.9708 | 1590 | 201] 1.5 [DL + LL] |
| Bottom | 1472.715 | 29.4543 | 92.8737 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.1262 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 53.1262 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.584 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.584 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C1 | 7351 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.044 |
| Bottom | 3054 | 0.62 | 0.059 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 197.25 | -16.3132 | -16.5239 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 254.1957 | 31.3466 | 8.7509 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1847 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.1847 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.288 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 15.288 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C2 | 7352 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.065 |
| Bottom | 3054 | 0.62 | 0.071 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 374.0527 | 7.9866 | -11.047 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 408.2201 | 0.085 | -12.0561 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2793 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2793 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.383 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.383 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C3 | 7353 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.043 |
| Bottom | 3054 | 0.62 | 0.051 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 194.2968 | -13.5172 | 17.2047 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 251.2425 | 20.8749 | -10.618 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9495 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.9495 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.0378 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.0378 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C4 | 7354 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.062 |
| Bottom | 3054 | 0.62 | 0.068 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 364.1857 | 10.7556 | 4.8424 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 398.3531 | -11.7647 | -3.1569 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2548 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 4.2548 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2497 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 5.2497 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C5 | 7355 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.039 |
| Bottom | 3054 | 0.62 | 0.045 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 191.4485 | 8.6664 | -15.0766 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 248.3941 | -11.3777 | 7.3359 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7252 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7252 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5401 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.5401 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C6 | 7356 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.063 |
| Bottom | 3054 | 0.62 | 0.069 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 363.1764 | -1.8434 | -10.7258 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 397.3438 | 10.9139 | -11.7349 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2203 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 2.2203 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7321 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 6.7321 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C7 | 7357 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.073 |
| Bottom | 3054 | 0.62 | 0.062 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 209.8407 | 41.7382 | 26.2183 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 266.7864 | -31.2401 | -12.3619 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.4516 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 12.4516 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 23.5967 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 23.5967 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C8 | 7358 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.067 |
| Bottom | 3054 | 0.62 | 0.072 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 342.8466 | -17.1265 | 21.2982 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 399.7922 | 18.8946 | -11.8072 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.327 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 8.327 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5199 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 11.5199 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C9 | 7359 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.267 |
| Bottom | 2688 | 0.75 | 0.276 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1171.4506 | -5.3789 | 30.692 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 1196.5532 | -31.3497 | 1.4314 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.4647 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 4.4647 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.0894 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.0894 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C10 | 7360 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.403 |
| Bottom | 2688 | 0.75 | 0.408 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1765.07 | -46.2448 | 7.5149 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 1790.1726 | -8.4465 | 46.9025 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 0.6251 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 0.6251 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.0814 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.0814 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C11 | 7361 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.217 |
| Bottom | 2688 | 0.75 | 0.19 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 782.4797 | 67.1779 | 20.501 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 824.3174 | -21.5971 | -0.7796 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.4721 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.4721 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.8626 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 23.8626 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C12 | 7362 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.221 |
| Bottom | 2688 | 0.75 | 0.224 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 955.6758 | 25.0387 | 0.1535 | 1860 | 201] 1.5 [DL + LL] |
| Bottom | 980.7784 | 3.7557 | 25.6964 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.7774 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 2.7774 | 1240 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.5288 | 3100 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 7.5288 | 1240 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C13 | 7591 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.604 |
| Bottom | 1609 | 0.67 | 0.278 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 264.7716 | -9.0655 | 205.5199 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 288.1647 | 18.104 | -93.6226 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 115.1666 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 115.1666 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.3912 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.3912 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C14 | 7593 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.081 |
| Bottom | 1609 | 0.67 | 0.078 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 107.4702 | 2.1494 | 31.7869 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 131.3131 | 2.6263 | -27.7804 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.4554 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 22.4554 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.132 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.132 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C15 | 7596 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.119 |
| Bottom | 1609 | 0.67 | 0.177 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 227.4512 | 7.0999 | 35.6159 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 250.8443 | -6.2105 | -67.4226 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 39.712 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 39.712 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.1602 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.1602 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C16 | 7598 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.246 |
| Bottom | 1609 | 0.67 | 0.217 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 204.4102 | -4.1991 | 94.5285 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 227.8033 | 6.4243 | -84.3093 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 68.8372 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 68.8372 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.0564 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.0564 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C18 | 7600 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.062 |
| Bottom | 1609 | 0.67 | 0.059 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 103.3347 | 2.0667 | -21.9592 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 127.1776 | 2.5436 | 16.4787 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.5201 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.5201 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0708 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0708 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C17 | 7603 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.068 |
| Bottom | 1609 | 0.67 | 0.074 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 194.4698 | -6.7028 | 6.9011 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 217.8629 | 7.0949 | -6.9426 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.2565 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 3.2565 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.2766 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.2766 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C20 | 7606 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.631 |
| Bottom | 1609 | 0.67 | 0.284 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 266.6566 | 7.6291 | 213.9565 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 290.0497 | -17.2174 | -97.8936 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 120.0018 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 120.0018 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.5836 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.5836 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C19 | 7608 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.069 |
| Bottom | 1609 | 0.67 | 0.074 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 200.2278 | 5.2584 | 12.9271 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 223.6209 | -5.701 | -11.2768 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.3639 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 9.3639 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2375 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.2375 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C21 | 7611 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.689 |
| Bottom | 1609 | 0.67 | 0.313 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 272.6465 | -7.1839 | -230.7507 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 296.0396 | 17.5865 | 109.777 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 130.8688 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 130.8688 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.5131 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 9.5131 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C22 | 7613 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.076 |
| Bottom | 1609 | 0.67 | 0.069 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 107.2878 | -2.1458 | 29.7106 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 131.1307 | 2.6226 | -22.6288 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.7498 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 19.7498 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.184 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.184 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C23 | 7616 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.338 |
| Bottom | 1609 | 0.67 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 211.3022 | 4.3096 | -124.8194 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 234.6953 | -5.5757 | 99.4395 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 86.175 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 86.175 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.8023 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.8023 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C24 | 7618 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.105 |
| Bottom | 1609 | 0.67 | 0.1 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 131.0259 | -2.6205 | -41.1691 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 154.8689 | 3.0974 | 37.5972 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.71 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 29.71 | 1060 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1843 | 2650 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1843 | 1060 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C25 | 7622 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.124 |
| Bottom | 1609 | 0.67 | 0.199 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 271.4832 | -6.9228 | -31.3318 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 294.8763 | 5.8975 | 76.1111 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.2446 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 41.2446 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.6762 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.6762 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C26 | 7624 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.685 |
| Bottom | 1609 | 0.67 | 0.299 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 289.9536 | 8.8207 | -232.0082 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 313.3467 | -17.5641 | 103.9263 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 129.1477 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 129.1477 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 10.1127 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 10.1127 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C27 | 7626 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.085 |
| Bottom | 1609 | 0.67 | 0.084 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 206.3193 | 6.3663 | -24.8647 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 229.7123 | -7.12 | 17.441 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.2394 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.2394 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.1798 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.1798 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C28 | 7630 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.099 |
| Bottom | 1609 | 0.67 | 0.092 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 208.916 | -5.4919 | -36.5059 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 232.3091 | 6.2469 | 26.1354 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.0219 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 24.0219 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.5082 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 4.5082 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C29 | 7634 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.075 |
| Bottom | 1609 | 0.67 | 0.111 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 170.6667 | -8.0707 | -5.4386 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 194.0598 | 8.0986 | -32.8678 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 11.2326 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 11.2326 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.2136 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 6.2136 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C30 | 7636 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.075 |
| Bottom | 1609 | 0.67 | 0.127 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 175.6748 | 7.4772 | 6.85 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 199.0679 | -7.9246 | -41.8966 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.7773 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 18.7773 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.9282 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.9282 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C31 | 7638 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.101 |
| Bottom | 1609 | 0.67 | 0.177 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 192.5104 | -9.0696 | -24.2814 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 215.9035 | 9.3727 | 63.5126 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 33.6765 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 33.6765 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0715 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.0715 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C32 | 7640 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.091 |
| Bottom | 1609 | 0.67 | 0.153 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 186.3323 | 7.6257 | -20.5424 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 209.7254 | -7.6747 | 55.6083 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.2387 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 29.2387 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.9036 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 5.9036 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C33 | 7642 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.379 |
| Bottom | 2545 | 0.85 | 0.396 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1379.7621 | 27.5952 | 5.9884 | 2080 | 201] 1.5 [DL + LL] |
| Bottom | 1403.1552 | -28.0631 | 83.4765 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.779 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 36.779 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.8728 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 5.8728 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C35 | 7648 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.354 |
| Bottom | 2545 | 0.85 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1155.0563 | -23.1011 | -117.1283 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1184.2977 | 23.686 | 90.5296 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 79.5503 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 79.5503 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.2648 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.2648 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C34 | 7650 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.268 |
| Bottom | 2545 | 0.85 | 0.269 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 953.5342 | 19.0707 | 53.372 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 982.7756 | -19.6555 | -40.7536 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.5232 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 36.5232 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.9592 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.9592 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C36 | 7654 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.323 |
| Bottom | 2545 | 0.85 | 0.328 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1147.1285 | -22.9426 | 65.2153 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1176.3699 | 23.5274 | -61.9418 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 49.2088 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 49.2088 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.4068 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 4.4068 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C37 | 7658 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.291 |
| Bottom | 1609 | 0.67 | 0.212 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 244.3101 | 4.8862 | 112.1602 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 267.7032 | -5.3541 | -82.9592 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 75.1262 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 75.1262 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8918 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.8918 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C38 | 7661 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.341 |
| Bottom | 1609 | 0.67 | 0.229 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 256.9713 | -5.1394 | 129.2032 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 280.3644 | 5.6073 | -89.8497 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 84.3028 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 84.3028 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.7226 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.7226 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C39 | 7664 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.068 |
| Bottom | 3663 | 0.65 | 0.073 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 446.8115 | -8.9362 | -4.6702 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 479.5619 | -9.7925 | 24.8733 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 15.7679 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 15.7679 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 4.6221 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 4.6221 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C40 | 7666 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.076 |
| Bottom | 3663 | 0.65 | 0.088 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 501.8645 | 10.0373 | -12.6682 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 534.6149 | 19.8702 | 27.7287 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 18.5594 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 18.5594 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 9.6343 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 9.6343 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C41 | 7668 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.067 |
| Bottom | 3663 | 0.65 | 0.074 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 442.9084 | -8.8582 | 6.5221 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 475.6587 | -12.2099 | -17.0637 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 15.0895 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 15.0895 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 5.7023 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 5.7023 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C42 | 7670 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.071 |
| Bottom | 3663 | 0.65 | 0.079 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 467.5243 | 9.3505 | 13.2778 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 500.2746 | 14.7964 | -25.9476 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 20.7861 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 20.7861 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 7.112 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 7.112 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C43 | 7672 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.34 |
| Bottom | 1609 | 0.67 | 0.375 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 942.3155 | 18.8463 | 32.4836 | 1560 | 201] 1.5 [DL + LL] |
| Bottom | 956.3513 | -19.127 | 66.7148 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.635 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 21.635 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3356 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 7.3356 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C44 | 7674 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.327 |
| Bottom | 1609 | 0.67 | 0.242 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 267.4932 | -5.3499 | -125.5137 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 290.8862 | 5.8177 | 95.0385 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 84.7485 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 84.7485 | 1040 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8269 | 2600 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.8269 | 1040 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C2 | 7689 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.028 |
| Bottom | 3054 | 0.62 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | -0.1042 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | -0.1558 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C4 | 7690 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.028 |
| Bottom | 3054 | 0.62 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | -0.0689 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | -0.1031 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C6 | 7691 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.028 |
| Bottom | 3054 | 0.62 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | -0.0237 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | -0.0355 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C8 | 7692 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.028 |
| Bottom | 3054 | 0.62 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 157.9784 | 4.6972 | 0.0395 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 193.2479 | 5.7459 | 0.059 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C9 | 7693 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.239 |
| Bottom | 2688 | 0.75 | 0.244 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1023.2378 | 39.0605 | -27.0135 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1057.7876 | -0.6026 | 27.9256 | 640 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7729 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 5.7729 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 15.5487 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 15.5487 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C10 | 7694 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.529 |
| Bottom | 2688 | 0.75 | 0.394 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1671.0721 | 203.2641 | -44.1163 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1714.2594 | -46.2307 | 45.2564 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.4476 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.4476 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 78.1636 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 78.1636 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C11 | 7695 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.269 |
| Bottom | 2688 | 0.75 | 0.351 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 635.8766 | 85.9969 | -84.7403 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 661.7889 | 136.6452 | -88.1935 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2082 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2082 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 24.8447 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 24.8447 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C12 | 7696 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.334 |
| Bottom | 2688 | 0.75 | 0.367 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 834.2967 | 94.2712 | 111.1828 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 860.209 | 118.3761 | 114.636 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2981 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.2981 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0826 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.0826 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C13 | 7824 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.798 |
| Bottom | 1609 | 0.67 | 0.769 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 59.5205 | 1.1904 | 214.2423 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 74.0962 | 4.3649 | 210.0942 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.698 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.698 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.0446 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.0446 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C14 | 7826 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.067 |
| Bottom | 1609 | 0.67 | 0.057 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | 0.3097 | 20.4861 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0586 | 0.6012 | 20.4858 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C15 | 7829 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.342 |
| Bottom | 1609 | 0.67 | 0.103 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 59.249 | 1.185 | 100.4212 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 83.5418 | 1.6708 | -39.496 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.8506 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 51.8506 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.0724 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.0724 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C16 | 7831 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.325 |
| Bottom | 1609 | 0.67 | 0.207 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 31.7161 | 0.6845 | 89.2173 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 46.2918 | 2.9873 | 62.3136 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.6381 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.6381 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4147 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.4147 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C18 | 7833 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.067 |
| Bottom | 1609 | 0.67 | 0.057 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | 0.3097 | -20.4884 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0586 | 0.6012 | -20.4988 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C17 | 7836 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.013 |
| Bottom | 1609 | 0.67 | 0.041 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 20.8019 | -0.416 | -5.7408 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 35.3776 | -0.7076 | -17.152 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0565 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.0565 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2207 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2207 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C20 | 7839 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.833 |
| Bottom | 1609 | 0.67 | 0.79 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 60.4578 | -1.2092 | 223.2606 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 75.0335 | -5.0908 | 215.4127 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.9745 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 4.9745 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4026 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.4026 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C19 | 7841 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.01 |
| Bottom | 1609 | 0.67 | 0.036 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 12.3825 | 0.2476 | 4.5513 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 36.6753 | 0.7335 | -15.5679 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.458 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.458 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1115 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1115 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C21 | 7844 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.86 |
| Bottom | 1609 | 0.67 | 0.815 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 62.0753 | 1.2955 | -230.5477 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 76.651 | 5.5147 | -222.0252 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.3601 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.3601 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.5922 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 2.5922 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C22 | 7846 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.067 |
| Bottom | 1609 | 0.67 | 0.057 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4979 | 0.31 | 20.4934 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0736 | 0.6015 | 20.4997 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C23 | 7849 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.45 |
| Bottom | 1609 | 0.67 | 0.303 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 37.8792 | -0.7576 | -121.8079 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 52.4549 | -2.2531 | -88.9255 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.3169 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 20.3169 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.0726 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 1.0726 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C24 | 7851 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.067 |
| Bottom | 1609 | 0.67 | 0.057 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | 0.3097 | -20.487 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 30.0586 | 0.6012 | -20.4913 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C25 | 7855 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.648 |
| Bottom | 1609 | 0.67 | 0.184 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 88.7997 | 1.776 | -184.0604 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 113.0926 | 2.2619 | 67.9087 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 93.299 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 93.299 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2839 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2839 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C26 | 7857 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.858 |
| Bottom | 1609 | 0.67 | 0.814 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.9217 | -1.5074 | -229.9399 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 76.4974 | -6.4154 | -221.7716 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 5.1536 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 5.1536 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.0135 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 3.0135 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C27 | 7859 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.026 |
| Bottom | 1609 | 0.67 | 0.021 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 14.8955 | 0.2979 | -10.002 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 39.1883 | 0.7934 | 8.8528 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.981 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.981 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2458 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2458 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C28 | 7863 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.042 |
| Bottom | 1609 | 0.67 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 17.1602 | -0.3432 | -14.894 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 41.453 | -0.8291 | 3.0157 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.6271 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.6271 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1563 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1563 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C29 | 7867 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.052 |
| Bottom | 1609 | 0.67 | 0.083 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 16.8311 | 0.3366 | -16.8416 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 31.4067 | 0.6281 | -27.5682 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.6271 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.6271 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1563 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1563 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C30 | 7869 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.033 |
| Bottom | 1609 | 0.67 | 0.065 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.0958 | -0.3859 | -11.9945 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 33.6715 | -0.7777 | -23.2992 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.981 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 6.981 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2458 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2458 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C31 | 7871 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.012 |
| Bottom | 1609 | 0.67 | 0.041 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 21.4069 | 0.4281 | 4.3934 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 35.9826 | 0.7197 | 15.8449 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0565 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.0565 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2207 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.2207 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C32 | 7873 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.017 |
| Bottom | 1609 | 0.67 | 0.05 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 21.5919 | -0.4318 | 6.8099 | 1620 | 201] 1.5 [DL + LL] |
| Bottom | 36.1676 | -0.7234 | 18.9036 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.458 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.458 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1115 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1115 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C33 | 7875 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.392 |
| Bottom | 2545 | 0.85 | 0.387 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1247.7741 | 24.9555 | -140.0501 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 1275.8908 | -25.5178 | 122.8144 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 104.5752 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 104.5752 | 1000 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 15.3723 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 15.3723 | 1000 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C35 | 7881 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.959 |
| Bottom | 2545 | 0.85 | 0.86 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1048.6349 | 206.9733 | 179.1566 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1066.8545 | 210.5693 | 66.6591 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 69.6416 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 69.6416 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.2193 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.2193 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C34 | 7883 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.696 |
| Bottom | 2545 | 0.85 | 0.663 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 840.2698 | 165.8474 | 71.2064 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 870.6358 | -171.8409 | -14.9308 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 32.2735 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 32.2735 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.8416 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 3.8416 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C36 | 7887 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.373 |
| Bottom | 2545 | 0.85 | 0.315 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1049.418 | -20.9884 | -170.6398 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1067.6376 | -21.3528 | -87.7829 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.9467 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 50.9467 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.6308 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 6.6308 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C37 | 7891 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.389 |
| Bottom | 1609 | 0.67 | 0.279 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 73.2439 | 1.4649 | 115.6371 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 87.8196 | 1.7564 | 89.4512 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.2498 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 16.2498 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1857 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1857 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C38 | 7893 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.452 |
| Bottom | 1609 | 0.67 | 0.354 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 76.6009 | -1.532 | 132.2177 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 91.1766 | -1.8235 | 110.0053 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.8036 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 13.8036 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1385 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1385 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C39 | 7895 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.028 |
| Bottom | 3663 | 0.65 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.047 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0703 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C40 | 7896 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.028 |
| Bottom | 3663 | 0.65 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.0623 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0933 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C41 | 7897 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.028 |
| Bottom | 3663 | 0.65 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.0403 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0603 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C42 | 7898 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.028 |
| Bottom | 3663 | 0.65 | 0.034 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 180.5467 | 3.6109 | -0.044 | 1920 | 201] 1.5 [DL + LL] |
| Bottom | 220.8548 | 4.4171 | -0.0659 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1280 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 3200 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1280 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C43 | 7899 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.432 |
| Bottom | 1609 | 0.67 | 0.349 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 780.4269 | -27.6276 | -131.0126 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 802.9202 | 16.0584 | 86.3405 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 86.5066 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 86.5066 | 1000 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 15.823 | 2500 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 15.823 | 1000 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C44 | 7900 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.352 |
| Bottom | 1609 | 0.67 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 70.9423 | 0.0821 | -105.8187 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 85.518 | 1.7104 | -82.6777 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 14.3222 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 14.3222 | 1080 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.1506 | 2700 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0.1506 | 1080 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C2 | 7922 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.018 |
| Bottom | 3054 | 0.62 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | -0.0434 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | -0.0755 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C4 | 7923 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.018 |
| Bottom | 3054 | 0.62 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | -0.0287 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | -0.05 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C6 | 7924 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.018 |
| Bottom | 3054 | 0.62 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | -0.0099 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | -0.0172 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C8 | 7925 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.018 |
| Bottom | 3054 | 0.62 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 101.9511 | 2.9804 | 0.0165 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 134.4653 | 3.9309 | 0.0286 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C9 | 7926 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.189 |
| Bottom | 2688 | 0.75 | 0.298 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 589.819 | -56.6382 | 46.7679 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 613.7069 | -129.7875 | 57.3371 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.4766 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.4766 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 40.6879 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 40.6879 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C10 | 7927 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.272 |
| Bottom | 2688 | 0.75 | 0.349 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 749.6938 | -98.1314 | 59.4447 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 773.5818 | -146.6454 | 72.7373 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.3526 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.3526 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 27.1521 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 27.1521 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C11 | 7928 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.329 |
| Bottom | 2688 | 0.75 | 0.266 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 578.7884 | -132.4616 | -77.1324 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 602.6764 | -90.2549 | -80.3159 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2082 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2082 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 24.8447 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 24.8447 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C12 | 7929 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.326 |
| Bottom | 2688 | 0.75 | 0.315 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 777.2085 | -102.4131 | -103.575 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 801.0965 | -84.5564 | -106.7584 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2981 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.2981 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0826 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.0826 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C33 | 7982 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.532 |
| Bottom | 2545 | 0.85 | 0.522 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 798.8191 | -80.8091 | 222.7172 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 815.3517 | -82.4815 | 210.5958 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.7467 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 8.7467 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.0983 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 2.0983 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C35 | 7987 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.822 |
| Bottom | 2545 | 0.85 | 0.909 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 788.7051 | 155.6699 | 229.7706 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 816.2595 | -161.1084 | -292.4847 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 213.3368 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 213.3368 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.824 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 7.824 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C34 | 7989 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.746 |
| Bottom | 2545 | 0.85 | 0.612 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 733.5671 | -144.7871 | -196.7186 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 750.0997 | -148.0502 | -54.3643 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 96.462 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 96.462 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.1064 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 9.1064 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C36 | 7992 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.27 |
| Bottom | 2545 | 0.85 | 0.348 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 708.5715 | 20.7004 | -127.6832 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 736.1259 | 14.7225 | 209.7328 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 137.64 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 137.64 | 980 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.5043 | 2450 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 7.5043 | 980 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C37 | 7996 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.018 |
| Bottom | 1609 | 0.67 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | 0.9987 | 0.202 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | 1.3172 | 0.3513 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C38 | 7997 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.018 |
| Bottom | 1609 | 0.67 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | -0.9987 | 0.2147 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | -1.3172 | 0.3733 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C39 | 7998 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.018 |
| Bottom | 3663 | 0.65 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0196 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0341 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C40 | 7999 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.018 |
| Bottom | 3663 | 0.65 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.026 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0452 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C41 | 8000 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.018 |
| Bottom | 3663 | 0.65 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0168 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0292 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C42 | 8001 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.018 |
| Bottom | 3663 | 0.65 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 116.5156 | 2.3303 | -0.0183 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 153.6746 | 3.0735 | -0.0319 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C43 | 8002 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.018 |
| Bottom | 1609 | 0.67 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | -0.9987 | 0.005 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | -1.3172 | 0.0087 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C44 | 8003 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.018 |
| Bottom | 1609 | 0.67 | 0.024 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 49.9353 | 0.9987 | -0.116 | 1770 | 201] 1.5 [DL + LL] |
| Bottom | 65.8606 | 1.3172 | -0.2018 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1180 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 2950 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1180 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C2 | 8029 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.006 |
| Bottom | 3054 | 0.62 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | -0.0043 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | -0.0269 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C4 | 8030 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.006 |
| Bottom | 3054 | 0.62 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | -0.0029 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | -0.0178 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C6 | 8031 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.006 |
| Bottom | 3054 | 0.62 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | -0.001 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | -0.0061 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C8 | 8032 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.006 |
| Bottom | 3054 | 0.62 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 32.11 | 1.0299 | 0.0016 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 80.275 | 2.5747 | 0.0102 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 775.9 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C9 | 8033 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.476 |
| Bottom | 2688 | 0.75 | 0.254 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 514.9161 | 218.0442 | -57.3202 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 550.3026 | 113.6796 | -43.6346 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.4766 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 8.4766 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 40.6879 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 40.6879 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C10 | 8034 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.296 |
| Bottom | 2688 | 0.75 | 0.23 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 674.7909 | 115.6927 | -70.5669 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 733.7685 | -65.5098 | 58.182 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.3526 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 10.3526 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 27.1521 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 27.1521 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C11 | 8035 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.53 |
| Bottom | 2688 | 0.75 | 0.395 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 519.8108 | -234.4295 | -69.2728 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 555.1974 | -173.7196 | -73.9886 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.2082 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 1.2082 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 24.8447 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 24.8447 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C12 | 8036 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.376 |
| Bottom | 2688 | 0.75 | 0.341 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 718.2309 | -145.2554 | -95.7153 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 753.6175 | -119.8212 | -100.4311 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2981 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 3.2981 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0826 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 665.06 | 11.0826 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C33 | 8084 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.571 |
| Bottom | 2545 | 0.85 | 0.403 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 531.3977 | 105.546 | -167.8827 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 574.9223 | -63.7413 | -162.2222 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.1452 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 1.1452 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 21.6838 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 21.6838 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C35 | 8089 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.816 |
| Bottom | 2545 | 0.85 | 0.572 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 508.0294 | -155.1549 | -161.1385 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 551.5541 | 114.1312 | -133.3487 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0599 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 7.0599 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 23.5291 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 23.5291 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C34 | 8091 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.818 |
| Bottom | 2545 | 0.85 | 0.594 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 556.4712 | 167.9374 | 115.0146 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 599.9959 | -122.7333 | 125.4335 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.4118 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 2.4118 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 25.0281 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 25.0281 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C36 | 8094 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.507 |
| Bottom | 2545 | 0.85 | 0.246 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 474.0608 | -87.6837 | 178.1118 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 517.5855 | 42.9287 | 72.7228 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 27.3197 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 27.3197 | 1548 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 27.2635 | 3870 | 201] 1.5 [DL + LL] |
| Bottom | 1108.43 | 27.2635 | 1548 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C37 | 8098 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.007 |
| Bottom | 1609 | 0.67 | 0.017 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | 0.8151 | 0.02 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | 2.0378 | 0.1253 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C38 | 8099 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.007 |
| Bottom | 1609 | 0.67 | 0.017 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | -0.8151 | 0.0213 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | -2.0378 | 0.1331 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C39 | 8100 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.006 |
| Bottom | 3663 | 0.65 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0019 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0121 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C40 | 8101 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.006 |
| Bottom | 3663 | 0.65 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0026 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0161 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C41 | 8102 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.006 |
| Bottom | 3663 | 0.65 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0017 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0104 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C42 | 8103 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.006 |
| Bottom | 3663 | 0.65 | 0.014 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 36.6972 | 0.81 | -0.0018 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 91.7429 | 2.0251 | -0.0114 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 443.37 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 1551.81 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C43 | 8104 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.007 |
| Bottom | 1609 | 0.67 | 0.017 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | -0.8151 | 0.0005 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | -2.0378 | 0.0031 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C44 | 8105 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.007 |
| Bottom | 1609 | 0.67 | 0.017 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.7274 | 0.8151 | -0.0115 | 2622 | 201] 1.5 [DL + LL] |
| Bottom | 39.3184 | 2.0378 | -0.0719 | 0 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 332.53 | 0 | 1748 | 201] 1.5 [DL + LL] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0 | 4370 | 201] 1.5 [DL + LL] |
| Bottom | 886.75 | 0 | 1748 | 201] 1.5 [DL + LL] |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Shear Wall Design

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.735 | 201] 1.5 [DL + LL] | 1723.0672 | -26.46 | -242.3076 |
| Bottom | 0.639 | 201] 1.5 [DL + LL] | 1765.5797 | 23.9311 | 14.1079 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1723.0672 | -242.3076 | 81.0347 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1765.5797 | 14.1079 | 81.0347 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.709 | 201] 1.5 [DL + LL] | 1937.9136 | -22.6549 | 80.0476 |
| Bottom | 0.713 | 201] 1.5 [DL + LL] | 1980.4261 | 23.7177 | -28.1018 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1937.9136 | 80.0476 | -34.777 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1980.4261 | -28.1018 | -34.777 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.774 | 201] 1.5 [DL + LL] | 2155.1952 | -23.6706 | 42.7313 |
| Bottom | 0.784 | 201] 1.5 [DL + LL] | 2197.7077 | 24.0069 | -32.7595 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2155.1952 | 42.7313 | -24.3757 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2197.7077 | -32.7595 | -24.3757 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.846 | 201] 1.5 [DL + LL] | 2374.0893 | -24.7875 | 39.7336 |
| Bottom | 0.856 | 201] 1.5 [DL + LL] | 2416.6017 | 24.8263 | -32.9347 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2374.0893 | 39.7336 | -23.493 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2416.6017 | -32.9347 | -23.493 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.918 | 201] 1.5 [DL + LL] | 2594.3334 | -25.4648 | 40.6169 |
| Bottom | 0.932 | 201] 1.5 [DL + LL] | 2636.8459 | 25.4734 | -33.4712 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2594.3334 | 40.6169 | -23.9544 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2636.8459 | -33.4712 | -23.9544 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.993 | 201] 1.5 [DL + LL] | 2815.5997 | -26.0114 | 40.8541 |
| Bottom | 1.008 | 201] 1.5 [DL + LL] | 2858.1122 | 25.9756 | -33.9316 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2815.5997 | 40.8541 | -24.1823 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2858.1122 | -33.9316 | -24.1823 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.006 | 201] 1.5 [DL + LL] | 3037.5695 | -26.4267 | 40.8568 |
| Bottom | 1.021 | 201] 1.5 [DL + LL] | 3080.0819 | 26.3392 | -34.2621 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3037.5695 | 40.8568 | -24.2916 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3080.0819 | -34.2621 | -24.2916 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.078 | 201] 1.5 [DL + LL] | 3259.9289 | -26.7205 | 40.6706 |
| Bottom | 1.092 | 201] 1.5 [DL + LL] | 3302.4413 | 26.5627 | -34.6672 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3259.9289 | 40.6706 | -24.3626 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3302.4413 | -34.6672 | -24.3626 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.18 | 201] 1.5 [DL + LL] | 3482.3602 | -26.9112 | 40.067 |
| Bottom | 1.194 | 201] 1.5 [DL + LL] | 3524.8727 | 26.7708 | -34.1556 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3482.3602 | 40.067 | -24.0093 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3524.8727 | -34.1556 | -24.0093 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.253 | 201] 1.5 [DL + LL] | 3704.5313 | -26.7877 | 40.0805 |
| Bottom | 1.267 | 201] 1.5 [DL + LL] | 3747.0438 | 26.2162 | -31.2925 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3704.5313 | 40.0805 | -23.0958 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3747.0438 | -31.2925 | -23.0958 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.109 | 201] 1.5 [DL + LL] | 3926.2767 | -27.5379 | 42.2915 |
| Bottom | 1.116 | 201] 1.5 [DL + LL] | 3968.7891 | 26.4847 | -76.385 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3926.2767 | 42.2915 | -38.158 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3968.7891 | -76.385 | -38.158 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.175 | 201] 1.5 [DL + LL] | 4148.1278 | -28.5192 | -5.9208 |
| Bottom | 1.203 | 201] 1.5 [DL + LL] | 4190.6403 | 32.7261 | 233.3654 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4148.1278 | -5.9208 | 75.6266 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4190.6403 | 233.3654 | 75.6266 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.313 | 201] 1.5 [DL + LL] | 4381.3539 | -86.6057 | -929.2411 |
| Bottom | 1.079 | 201] 1.5 [DL + LL] | 4445.1226 | 75.9999 | -17.432 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4381.3539 | -929.2411 | 289.3839 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4445.1226 | -17.432 | 289.3839 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.148 | 201] 1.5 [DL + LL] | 4653.1167 | -81.0209 | 82.9692 |
| Bottom | 1.14 | 201] 1.5 [DL + LL] | 4716.8854 | 79.1036 | -15.744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4653.1167 | 82.9692 | -31.8068 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4716.8854 | -15.744 | -31.8068 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.19 | 201] 1.5 [DL + LL] | 4922.5882 | -76.2922 | 82.5727 |
| Bottom | 1.193 | 201] 1.5 [DL + LL] | 4986.3568 | 76.1572 | -41.0854 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4922.5882 | 82.5727 | -39.617 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4986.3568 | -41.0854 | -39.617 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.235 | 201] 1.5 [DL + LL] | 5188.9947 | -75.3832 | 55.1906 |
| Bottom | 1.241 | 201] 1.5 [DL + LL] | 5252.7634 | 74.5115 | -38.1465 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5188.9947 | 55.1906 | -29.9617 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5252.7634 | -38.1465 | -29.9617 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.284 | 201] 1.5 [DL + LL] | 5452.8563 | -74.1114 | 55.6729 |
| Bottom | 1.294 | 201] 1.5 [DL + LL] | 5516.625 | 73.0665 | -36.7644 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5452.8563 | 55.6729 | -29.6518 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5516.625 | -36.7644 | -29.6518 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.337 | 201] 1.5 [DL + LL] | 5714.2454 | -72.6761 | 54.6668 |
| Bottom | 1.351 | 201] 1.5 [DL + LL] | 5778.014 | 71.4218 | -37.8016 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5714.2454 | 54.6668 | -29.6331 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5778.014 | -37.8016 | -29.6331 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.394 | 201] 1.5 [DL + LL] | 5973.0352 | -71.4392 | 51.0513 |
| Bottom | 1.407 | 201] 1.5 [DL + LL] | 6036.8038 | 70.3606 | -39.4707 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5973.0352 | 51.0513 | -28.994 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6036.8038 | -39.4707 | -28.994 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.449 | 201] 1.5 [DL + LL] | 6228.9505 | -69.1803 | 46.4727 |
| Bottom | 1.46 | 201] 1.5 [DL + LL] | 6292.7192 | 65.8041 | -36.3385 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6228.9505 | 46.4727 | -26.5359 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6292.7192 | -36.3385 | -26.5359 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.508 | 201] 1.5 [DL + LL] | 6482.2317 | -72.4847 | 46.5603 |
| Bottom | 1.533 | 201] 1.5 [DL + LL] | 6548.0248 | 82.0769 | -17.2684 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6482.2317 | 46.5603 | -19.8539 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6548.0248 | -17.2684 | -19.8539 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.754 | 201] 1.5 [DL + LL] | 6758.0082 | -176.1169 | 47.9992 |
| Bottom | 1.773 | 201] 1.5 [DL + LL] | 6843.0331 | 178.6167 | 24.3231 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6758.0082 | 47.9992 | -5.6984 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6843.0331 | 24.3231 | -5.6984 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.805 | 201] 1.5 [DL + LL] | 6991.2809 | -179.4422 | 37.8157 |
| Bottom | 1.829 | 201] 1.5 [DL + LL] | 7072.6619 | 181.6341 | -53.3314 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6991.2809 | 37.8157 | -22.5594 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7072.6619 | -53.3314 | -22.5594 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.621 | 201] 1.5 [DL + LL] | 899.1827 | 120.5578 | 65.6937 |
| Bottom | 1.101 | 201] 1.5 [DL + LL] | 941.6952 | -101.0874 | 20.6831 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 899.1827 | 65.6937 | -14.2022 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 941.6952 | 20.6831 | -14.2022 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.942 | 201] 1.5 [DL + LL] | 1211.3329 | 88.3781 | -60.411 |
| Bottom | 0.943 | 201] 1.5 [DL + LL] | 1253.8453 | -90.8111 | 37.3036 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1211.3329 | -60.411 | 31.136 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1253.8453 | 37.3036 | 31.136 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.006 | 201] 1.5 [DL + LL] | 1519.8856 | 93.4356 | -46.0945 |
| Bottom | 0.992 | 201] 1.5 [DL + LL] | 1562.3981 | -92.0711 | 41.0968 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1519.8856 | -46.0945 | 27.7974 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1562.3981 | 41.0968 | 27.7974 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.042 | 201] 1.5 [DL + LL] | 1826.7332 | 91.837 | -42.1346 |
| Bottom | 1.046 | 201] 1.5 [DL + LL] | 1869.2456 | -91.3616 | 40.4742 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1826.7332 | -42.1346 | 26.3602 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1869.2456 | 40.4742 | 26.3602 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.084 | 201] 1.5 [DL + LL] | 2132.2517 | 91.6862 | -41.8189 |
| Bottom | 1.088 | 201] 1.5 [DL + LL] | 2174.7642 | -91.1806 | 39.5982 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2132.2517 | -41.8189 | 25.9999 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2174.7642 | 39.5982 | 25.9999 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.155 | 201] 1.5 [DL + LL] | 2437.0799 | 91.4881 | -41.5672 |
| Bottom | 1.163 | 201] 1.5 [DL + LL] | 2479.5924 | -91.0975 | 38.7709 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2437.0799 | -41.5672 | 25.6722 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2479.5924 | 38.7709 | 25.6722 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.202 | 201] 1.5 [DL + LL] | 2741.8002 | 91.514 | -41.0572 |
| Bottom | 1.21 | 201] 1.5 [DL + LL] | 2784.3126 | -91.2105 | 37.9804 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2741.8002 | -41.0572 | 25.271 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2784.3126 | 37.9804 | 25.271 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.283 | 201] 1.5 [DL + LL] | 3047.0037 | 91.6964 | -40.2666 |
| Bottom | 1.291 | 201] 1.5 [DL + LL] | 3089.5161 | -91.455 | 36.9426 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3047.0037 | -40.2666 | 24.6998 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3089.5161 | 36.9426 | 24.6998 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.314 | 201] 1.5 [DL + LL] | 3353.3004 | 92.1335 | -39.4558 |
| Bottom | 1.322 | 201] 1.5 [DL + LL] | 3395.8128 | -92.0993 | 35.5435 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3353.3004 | -39.4558 | 24.0041 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3395.8128 | 35.5435 | 24.0041 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.398 | 201] 1.5 [DL + LL] | 3661.2311 | 92.3914 | -38.8414 |
| Bottom | 1.407 | 201] 1.5 [DL + LL] | 3703.7435 | -91.8274 | 37.1823 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3661.2311 | -38.8414 | 24.3342 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3703.7435 | 37.1823 | 24.3342 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.434 | 201] 1.5 [DL + LL] | 3971.8048 | 94.6681 | -34.3702 |
| Bottom | 1.465 | 201] 1.5 [DL + LL] | 4014.3173 | -96.5472 | 76.4493 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3971.8048 | -34.3702 | 35.4835 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4014.3173 | 76.4493 | 35.4835 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.492 | 201] 1.5 [DL + LL] | 4284.3353 | 89.6955 | 12.0071 |
| Bottom | 1.558 | 201] 1.5 [DL + LL] | 4326.8478 | -80.5485 | -266.9814 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4284.3353 | 12.0071 | -88.4492 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4326.8478 | -266.9814 | -88.4492 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.331 | 201] 1.5 [DL + LL] | 4557.884 | 80.0414 | 987.8583 |
| Bottom | 1.122 | 201] 1.5 [DL + LL] | 4621.6527 | -75.042 | 60.7006 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4557.884 | 987.8583 | -294.7199 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4621.6527 | 60.7006 | -294.7199 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.165 | 201] 1.5 [DL + LL] | 4840.2427 | 76.711 | 40.6334 |
| Bottom | 1.173 | 201] 1.5 [DL + LL] | 4904.0113 | -76.038 | -27.9825 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4840.2427 | 40.6334 | -21.5141 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4904.0113 | -27.9825 | -21.5141 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.219 | 201] 1.5 [DL + LL] | 5127.6117 | 75.2713 | -43.3564 |
| Bottom | 1.225 | 201] 1.5 [DL + LL] | 5191.3804 | -74.8036 | -5.5108 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5127.6117 | -43.3564 | 12.201 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5191.3804 | -5.5108 | 12.201 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.275 | 201] 1.5 [DL + LL] | 5417.9784 | 74.9423 | -20.2345 |
| Bottom | 1.289 | 201] 1.5 [DL + LL] | 5481.7471 | -74.2794 | 1.6185 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5417.9784 | -20.2345 | 7.0659 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5481.7471 | 1.6185 | 7.0659 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.34 | 201] 1.5 [DL + LL] | 5711.8532 | 74.4771 | -10.4391 |
| Bottom | 1.354 | 201] 1.5 [DL + LL] | 5775.6219 | -73.8222 | 1.5184 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5711.8532 | -10.4391 | 3.9075 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5775.6219 | 1.5184 | 3.9075 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.406 | 201] 1.5 [DL + LL] | 6009.4739 | 74.0221 | -7.34 |
| Bottom | 1.42 | 201] 1.5 [DL + LL] | 6073.2426 | -73.393 | 1.8338 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6009.4739 | -7.34 | 3.018 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6073.2426 | 1.8338 | 3.018 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.473 | 201] 1.5 [DL + LL] | 6311.2824 | 73.6867 | -3.2986 |
| Bottom | 1.487 | 201] 1.5 [DL + LL] | 6375.0511 | -73.2831 | 5.6969 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6311.2824 | -3.2986 | 2.9693 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6375.0511 | 5.6969 | 2.9693 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.54 | 201] 1.5 [DL + LL] | 6616.9031 | 72.7461 | 4.0672 |
| Bottom | 1.553 | 201] 1.5 [DL + LL] | 6680.6718 | -72.0027 | -15.2925 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6616.9031 | 4.0672 | -6.0115 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6680.6718 | -15.2925 | -6.0115 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.612 | 201] 1.5 [DL + LL] | 6930.9413 | 74.5875 | -8.8306 |
| Bottom | 1.63 | 201] 1.5 [DL + LL] | 6996.7344 | -78.7781 | 20.2348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6930.9413 | -8.8306 | 9.0608 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6996.7344 | 20.2348 | 9.0608 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.032 | 201] 1.5 [DL + LL] | 7227.2016 | 238.464 | -41.4358 |
| Bottom | 2.057 | 201] 1.5 [DL + LL] | 7312.2265 | -240.9637 | 48.6609 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7227.2016 | -41.4358 | 21.5595 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7312.2265 | 48.6609 | 21.5595 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.013 | 201] 1.5 [DL + LL] | 7486.9659 | 218.9488 | -54.3855 |
| Bottom | 2.02 | 201] 1.5 [DL + LL] | 7568.3468 | -221.1407 | 5.4289 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7486.9659 | -54.3855 | 14.9347 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7568.3468 | 5.4289 | 14.9347 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.648 | 201] 1.5 [DL + LL] | 1369.1469 | 33.8561 | -180.3207 |
| Bottom | 0.556 | 201] 1.5 [DL + LL] | 1411.6593 | -30.912 | -12.4954 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1369.1469 | -180.3207 | 53.0525 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1411.6593 | -12.4954 | 53.0525 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.618 | 201] 1.5 [DL + LL] | 1557.8252 | 31.8222 | 51.9722 |
| Bottom | 0.622 | 201] 1.5 [DL + LL] | 1600.3377 | -31.7998 | -25.7537 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1557.8252 | 51.9722 | -25.0057 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1600.3377 | -25.7537 | -25.0057 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 201] 1.5 [DL + LL] | 1749.6908 | 33.2971 | 40.8146 |
| Bottom | 0.687 | 201] 1.5 [DL + LL] | 1792.2032 | -32.9723 | -29.4066 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1749.6908 | 40.8146 | -22.6158 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1792.2032 | -29.4066 | -22.6158 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.739 | 201] 1.5 [DL + LL] | 1943.3834 | 33.4967 | 38.4474 |
| Bottom | 0.749 | 201] 1.5 [DL + LL] | 1985.8958 | -33.3131 | -30.6477 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1943.3834 | 38.4474 | -22.2659 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1985.8958 | -30.6477 | -22.2659 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.801 | 201] 1.5 [DL + LL] | 2138.3627 | 33.7309 | 38.5212 |
| Bottom | 0.81 | 201] 1.5 [DL + LL] | 2180.8752 | -33.4126 | -31.5959 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2138.3627 | 38.5212 | -22.5988 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2180.8752 | -31.5959 | -22.5988 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.862 | 201] 1.5 [DL + LL] | 2334.2617 | 33.7056 | 38.9648 |
| Bottom | 0.871 | 201] 1.5 [DL + LL] | 2376.7741 | -33.2658 | -32.5894 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2334.2617 | 38.9648 | -23.0615 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2376.7741 | -32.5894 | -23.0615 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.923 | 201] 1.5 [DL + LL] | 2530.7317 | 33.4234 | 39.4764 |
| Bottom | 0.932 | 201] 1.5 [DL + LL] | 2573.2441 | -32.8663 | -33.5783 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2530.7317 | 39.4764 | -23.5425 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2573.2441 | -33.5783 | -23.5425 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.983 | 201] 1.5 [DL + LL] | 2727.4217 | 32.8815 | 40.1208 |
| Bottom | 0.992 | 201] 1.5 [DL + LL] | 2769.9342 | -32.2354 | -34.5798 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2727.4217 | 40.1208 | -24.0676 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2769.9342 | -34.5798 | -24.0676 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.043 | 201] 1.5 [DL + LL] | 2923.9727 | 32.0261 | 40.8998 |
| Bottom | 1.053 | 201] 1.5 [DL + LL] | 2966.4851 | -31.1508 | -34.8656 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2923.9727 | 40.8998 | -24.4051 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2966.4851 | -34.8656 | -24.4051 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.104 | 201] 1.5 [DL + LL] | 3120.1015 | 31.2056 | 42.5816 |
| Bottom | 1.119 | 201] 1.5 [DL + LL] | 3162.6139 | -30.9232 | -36.0969 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3120.1015 | 42.5816 | -25.322 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3162.6139 | -36.0969 | -25.322 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.941 | 201] 1.5 [DL + LL] | 3315.1089 | 28.2451 | 43.6738 |
| Bottom | 0.947 | 201] 1.5 [DL + LL] | 3357.6214 | -25.9023 | -80.2506 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3315.1089 | 43.6738 | -39.7378 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3357.6214 | -80.2506 | -39.7378 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.002 | 201] 1.5 [DL + LL] | 3508.1331 | 30.9458 | -0.5853 |
| Bottom | 1.035 | 201] 1.5 [DL + LL] | 3550.6455 | -33.8751 | 206.1226 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3508.1331 | -0.5853 | 65.309 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3550.6455 | 206.1226 | 65.309 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.218 | 201] 1.5 [DL + LL] | 3744.8598 | 99.5994 | -752.9412 |
| Bottom | 0.991 | 201] 1.5 [DL + LL] | 3808.6284 | -87.6655 | -52.1513 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3744.8598 | -752.9412 | 222.3874 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3808.6284 | -52.1513 | 222.3874 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.983 | 201] 1.5 [DL + LL] | 4005.9225 | 67.8448 | 67.1282 |
| Bottom | 0.991 | 201] 1.5 [DL + LL] | 4069.6911 | -70.4266 | -18.5445 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4005.9225 | 67.1282 | -27.6168 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4069.6911 | -18.5445 | -27.6168 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.05 | 201] 1.5 [DL + LL] | 4259.0395 | 72.4136 | 95.697 |
| Bottom | 1.045 | 201] 1.5 [DL + LL] | 4322.8081 | -69.7146 | -43.7585 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4259.0395 | 95.697 | -44.5927 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4322.8081 | -43.7585 | -44.5927 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.084 | 201] 1.5 [DL + LL] | 4506.7615 | 68.3461 | 64.9654 |
| Bottom | 1.087 | 201] 1.5 [DL + LL] | 4570.5301 | -66.4382 | -44.0378 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4506.7615 | 64.9654 | -34.8858 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4570.5301 | -44.0378 | -34.8858 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.122 | 201] 1.5 [DL + LL] | 4747.8775 | 64.8577 | 58.3897 |
| Bottom | 1.128 | 201] 1.5 [DL + LL] | 4811.6462 | -62.8728 | -39.1822 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4747.8775 | 58.3897 | -31.2367 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4811.6462 | -39.1822 | -31.2367 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.163 | 201] 1.5 [DL + LL] | 4982.0685 | 61.2015 | 56.8855 |
| Bottom | 1.177 | 201] 1.5 [DL + LL] | 5045.8372 | -59.4998 | -36.292 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4982.0685 | 56.8855 | -29.8141 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5045.8372 | -36.292 | -29.8141 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.209 | 201] 1.5 [DL + LL] | 5208.8207 | 56.3326 | 53.3675 |
| Bottom | 1.221 | 201] 1.5 [DL + LL] | 5272.5894 | -53.0223 | -41.308 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5208.8207 | 53.3675 | -30.2632 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5272.5894 | -41.308 | -30.2632 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.259 | 201] 1.5 [DL + LL] | 5428.4704 | 56.2915 | 41.5018 |
| Bottom | 1.278 | 201] 1.5 [DL + LL] | 5492.239 | -62.1269 | -48.8915 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5428.4704 | 41.5018 | -28.9124 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5492.239 | -48.8915 | -28.9124 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.277 | 201] 1.5 [DL + LL] | 5635.6726 | 26.1109 | 27.993 |
| Bottom | 1.277 | 201] 1.5 [DL + LL] | 5701.4657 | 13.1254 | 82.8289 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5635.6726 | 27.993 | 16.6928 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5701.4657 | 82.8289 | 16.6928 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.778 | 201] 1.5 [DL + LL] | 6170.6732 | -215.4314 | -45.8405 |
| Bottom | 1.815 | 201] 1.5 [DL + LL] | 6255.6981 | 217.9311 | 100.8747 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6170.6732 | -45.8405 | 34.9181 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6255.6981 | 100.8747 | 34.9181 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.68 | 201] 1.5 [DL + LL] | 6736.1915 | -151.5045 | 15.3906 |
| Bottom | 1.712 | 201] 1.5 [DL + LL] | 6817.5725 | 153.6964 | -72.4667 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6736.1915 | 15.3906 | -21.6719 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6817.5725 | -72.4667 | -21.6719 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.673 | 201] 1.5 [DL + LL] | 1368.2263 | -37.1849 | -186.2939 |
| Bottom | 0.572 | 201] 1.5 [DL + LL] | 1410.7387 | 35.1287 | -12.4181 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1368.2263 | -186.2939 | 55.0103 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1410.7387 | -12.4181 | 55.0103 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.631 | 201] 1.5 [DL + LL] | 1555.5609 | -35.6501 | 43.6628 |
| Bottom | 0.636 | 201] 1.5 [DL + LL] | 1598.0734 | 35.9463 | -22.0386 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1555.5609 | 43.6628 | -21.1605 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1598.0734 | -22.0386 | -21.1605 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.688 | 201] 1.5 [DL + LL] | 1745.6728 | -36.7804 | 35.971 |
| Bottom | 0.699 | 201] 1.5 [DL + LL] | 1788.1853 | 36.7952 | -25.5853 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1745.6728 | 35.971 | -19.8395 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1788.1853 | -25.5853 | -19.8395 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.748 | 201] 1.5 [DL + LL] | 1937.269 | -36.8698 | 33.7463 |
| Bottom | 0.759 | 201] 1.5 [DL + LL] | 1979.7814 | 36.9416 | -26.7783 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1937.269 | 33.7463 | -19.5194 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1979.7814 | -26.7783 | -19.5194 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.808 | 201] 1.5 [DL + LL] | 2129.8709 | -36.9725 | 33.8902 |
| Bottom | 0.819 | 201] 1.5 [DL + LL] | 2172.3833 | 36.8822 | -27.6269 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2129.8709 | 33.8902 | -19.8426 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2172.3833 | -27.6269 | -19.8426 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.868 | 201] 1.5 [DL + LL] | 2323.1341 | -36.8159 | 34.4542 |
| Bottom | 0.878 | 201] 1.5 [DL + LL] | 2365.6466 | 36.5954 | -28.5916 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2323.1341 | 34.4542 | -20.3339 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2365.6466 | -28.5916 | -20.3339 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.927 | 201] 1.5 [DL + LL] | 2516.7123 | -36.3859 | 35.0206 |
| Bottom | 0.937 | 201] 1.5 [DL + LL] | 2559.2247 | 36.0567 | -29.6206 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2516.7123 | 35.0206 | -20.8445 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2559.2247 | -29.6206 | -20.8445 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.985 | 201] 1.5 [DL + LL] | 2710.239 | -35.673 | 35.6527 |
| Bottom | 0.995 | 201] 1.5 [DL + LL] | 2752.7514 | 35.2789 | -30.7179 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2710.239 | 35.6527 | -21.3962 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2752.7514 | -30.7179 | -21.3962 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.042 | 201] 1.5 [DL + LL] | 2903.323 | -34.6085 | 36.3627 |
| Bottom | 1.051 | 201] 1.5 [DL + LL] | 2945.8354 | 34.029 | -31.0775 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2903.323 | 36.3627 | -21.7362 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2945.8354 | -31.0775 | -21.7362 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.1 | 201] 1.5 [DL + LL] | 3095.6272 | -33.5184 | 37.9996 |
| Bottom | 1.115 | 201] 1.5 [DL + LL] | 3138.1397 | 33.6044 | -32.4763 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3095.6272 | 37.9996 | -22.6942 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3138.1397 | -32.4763 | -22.6942 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.936 | 201] 1.5 [DL + LL] | 3286.3732 | -30.2011 | 38.9589 |
| Bottom | 0.943 | 201] 1.5 [DL + LL] | 3328.8856 | 28.2778 | -76.6697 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3286.3732 | 38.9589 | -37.0839 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3328.8856 | -76.6697 | -37.0839 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.994 | 201] 1.5 [DL + LL] | 3474.6427 | -32.5446 | -5.2002 |
| Bottom | 1.032 | 201] 1.5 [DL + LL] | 3517.1551 | 36.166 | 203.1228 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3474.6427 | -5.2002 | 65.826 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3517.1551 | 203.1228 | 65.826 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.223 | 201] 1.5 [DL + LL] | 3713.2613 | -102.2321 | -748.816 |
| Bottom | 0.991 | 201] 1.5 [DL + LL] | 3777.0299 | 90.4874 | -47.531 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3713.2613 | -748.816 | 222.5285 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3777.0299 | -47.531 | 222.5285 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.983 | 201] 1.5 [DL + LL] | 3975.8633 | -70.0968 | 68.2699 |
| Bottom | 0.99 | 201] 1.5 [DL + LL] | 4039.632 | 72.8926 | -15.009 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3975.8633 | 68.2699 | -26.8606 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4039.632 | -15.009 | -26.8606 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.05 | 201] 1.5 [DL + LL] | 4230.3423 | -74.5727 | 96.0678 |
| Bottom | 1.045 | 201] 1.5 [DL + LL] | 4294.111 | 72.0287 | -41.7555 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4230.3423 | 96.0678 | -44.0724 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4294.111 | -41.7555 | -44.0724 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.083 | 201] 1.5 [DL + LL] | 4479.3175 | -70.3512 | 64.0648 |
| Bottom | 1.086 | 201] 1.5 [DL + LL] | 4543.0861 | 68.62 | -42.4858 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4479.3175 | 64.0648 | -34.1029 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4543.0861 | -42.4858 | -34.1029 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.121 | 201] 1.5 [DL + LL] | 4721.5686 | -66.6736 | 57.2703 |
| Bottom | 1.124 | 201] 1.5 [DL + LL] | 4785.3372 | 64.9017 | -37.7176 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4721.5686 | 57.2703 | -30.4111 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4785.3372 | -37.7176 | -30.4111 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.159 | 201] 1.5 [DL + LL] | 4956.7496 | -62.7846 | 55.93 |
| Bottom | 1.173 | 201] 1.5 [DL + LL] | 5020.5183 | 61.3363 | -35.1181 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4956.7496 | 55.93 | -29.1321 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5020.5183 | -35.1181 | -29.1321 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.205 | 201] 1.5 [DL + LL] | 5184.3169 | -57.6496 | 52.3976 |
| Bottom | 1.217 | 201] 1.5 [DL + LL] | 5248.0856 | 54.6324 | -41.0029 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5184.3169 | 52.3976 | -29.8525 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5248.0856 | -41.0029 | -29.8525 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.254 | 201] 1.5 [DL + LL] | 5404.5704 | -57.3005 | 39.9407 |
| Bottom | 1.274 | 201] 1.5 [DL + LL] | 5468.3391 | 63.4824 | -48.2855 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5404.5704 | 39.9407 | -28.2209 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5468.3391 | -48.2855 | -28.2209 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.272 | 201] 1.5 [DL + LL] | 5612.1401 | -26.7706 | 27.0048 |
| Bottom | 1.271 | 201] 1.5 [DL + LL] | 5677.9332 | -12.1724 | 86.6111 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5612.1401 | 27.0048 | 18.1646 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5677.9332 | 86.6111 | 18.1646 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.561 | 201] 1.5 [DL + LL] | 6147.202 | 146.7532 | -42.6764 |
| Bottom | 1.592 | 201] 1.5 [DL + LL] | 6232.2269 | -149.2529 | 93.3324 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6147.202 | -42.6764 | 32.3797 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6232.2269 | 93.3324 | 32.3797 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.848 | 201] 1.5 [DL + LL] | 6717.1896 | 210.9186 | 22.8473 |
| Bottom | 1.885 | 201] 1.5 [DL + LL] | 6798.5705 | -213.1106 | -78.3384 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6717.1896 | 22.8473 | -24.9815 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6798.5705 | -78.3384 | -24.9815 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.641 | 201] 1.5 [DL + LL] | 890.4627 | 121.9036 | -57.1127 |
| Bottom | 1.163 | 201] 1.5 [DL + LL] | 932.9751 | -102.6637 | -33.098 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 890.4627 | -57.1127 | 7.7009 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 932.9751 | -33.098 | 7.7009 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.949 | 201] 1.5 [DL + LL] | 1201.6202 | 89.1135 | 62.1344 |
| Bottom | 0.962 | 201] 1.5 [DL + LL] | 1244.1326 | -91.8426 | -47.6673 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1201.6202 | 62.1344 | -34.7704 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1244.1326 | -47.6673 | -34.7704 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.016 | 201] 1.5 [DL + LL] | 1509.0342 | 94.2665 | 48.8504 |
| Bottom | 1.01 | 201] 1.5 [DL + LL] | 1551.5467 | -92.9972 | -50.136 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1509.0342 | 48.8504 | -31.3054 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1551.5467 | -50.136 | -31.3054 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.047 | 201] 1.5 [DL + LL] | 1814.7027 | 92.5807 | 45.3874 |
| Bottom | 1.055 | 201] 1.5 [DL + LL] | 1857.2151 | -92.1785 | -48.7034 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1814.7027 | 45.3874 | -29.7376 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1857.2151 | -48.7034 | -29.7376 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.089 | 201] 1.5 [DL + LL] | 2118.9985 | 92.3809 | 45.2477 |
| Bottom | 1.096 | 201] 1.5 [DL + LL] | 2161.5109 | -91.9243 | -47.3826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2118.9985 | 45.2477 | -29.2631 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2161.5109 | -47.3826 | -29.2631 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.156 | 201] 1.5 [DL + LL] | 2422.5708 | 92.1383 | 44.8845 |
| Bottom | 1.167 | 201] 1.5 [DL + LL] | 2465.0832 | -91.7869 | -46.3122 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2422.5708 | 44.8845 | -28.7971 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2465.0832 | -46.3122 | -28.7971 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.203 | 201] 1.5 [DL + LL] | 2726.0155 | 92.1234 | 44.0743 |
| Bottom | 1.213 | 201] 1.5 [DL + LL] | 2768.5279 | -91.8593 | -45.4177 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2726.0155 | 44.0743 | -28.2462 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2768.5279 | -45.4177 | -28.2462 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.283 | 201] 1.5 [DL + LL] | 3029.9385 | 92.2622 | 42.8112 |
| Bottom | 1.294 | 201] 1.5 [DL + LL] | 3072.4509 | -92.0692 | -44.4198 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3029.9385 | 42.8112 | -27.5219 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3072.4509 | -44.4198 | -27.5219 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.312 | 201] 1.5 [DL + LL] | 3334.9666 | 92.6496 | 41.3078 |
| Bottom | 1.325 | 201] 1.5 [DL + LL] | 3377.479 | -92.6862 | -43.2926 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3334.9666 | 41.3078 | -26.6849 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3377.479 | -43.2926 | -26.6849 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.394 | 201] 1.5 [DL + LL] | 3641.6597 | 92.8342 | 39.629 |
| Bottom | 1.406 | 201] 1.5 [DL + LL] | 3684.1721 | -92.3506 | -45.3069 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3641.6597 | 39.629 | -26.8007 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3684.1721 | -45.3069 | -26.8007 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.43 | 201] 1.5 [DL + LL] | 3951.0574 | 95.0704 | 33.7778 |
| Bottom | 1.464 | 201] 1.5 [DL + LL] | 3993.5698 | -97.1603 | -84.7717 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3951.0574 | 33.7778 | -37.5943 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3993.5698 | -84.7717 | -37.5943 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.487 | 201] 1.5 [DL + LL] | 4262.4715 | 89.775 | -14.0231 |
| Bottom | 1.549 | 201] 1.5 [DL + LL] | 4304.984 | -80.6801 | 256.9012 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4262.4715 | -14.0231 | 86.1932 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4304.984 | 256.9012 | 86.1932 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.326 | 201] 1.5 [DL + LL] | 4535.4366 | 79.6153 | -986.0746 |
| Bottom | 1.119 | 201] 1.5 [DL + LL] | 4599.2052 | -74.7514 | -69.7221 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4535.4366 | -986.0746 | 291.5394 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4599.2052 | -69.7221 | 291.5394 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.161 | 201] 1.5 [DL + LL] | 4817.469 | 76.6653 | -44.1671 |
| Bottom | 1.166 | 201] 1.5 [DL + LL] | 4881.2376 | -75.8739 | 21.4463 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4817.469 | -44.1671 | 20.8083 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4881.2376 | 21.4463 | 20.8083 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 201] 1.5 [DL + LL] | 5104.6688 | 75.325 | 41.7514 |
| Bottom | 1.22 | 201] 1.5 [DL + LL] | 5168.4374 | -74.78 | -0.2319 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5104.6688 | 41.7514 | -13.2722 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5168.4374 | -0.2319 | -13.2722 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.27 | 201] 1.5 [DL + LL] | 5394.9655 | 75.0267 | 19.0284 |
| Bottom | 1.284 | 201] 1.5 [DL + LL] | 5458.7342 | -74.3363 | -8.0173 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5394.9655 | 19.0284 | -8.4766 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5458.7342 | -8.0173 | -8.4766 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.335 | 201] 1.5 [DL + LL] | 5688.861 | 74.6184 | 8.1821 |
| Bottom | 1.349 | 201] 1.5 [DL + LL] | 5752.6297 | -73.9547 | -8.7787 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5688.861 | 8.1821 | -5.2679 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5752.6297 | -8.7787 | -5.2679 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.402 | 201] 1.5 [DL + LL] | 5986.5943 | 74.2178 | 3.7241 |
| Bottom | 1.415 | 201] 1.5 [DL + LL] | 6050.363 | -73.6001 | -9.8457 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5986.5943 | 3.7241 | -4.2033 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6050.363 | -9.8457 | -4.2033 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.469 | 201] 1.5 [DL + LL] | 6288.6131 | 73.9308 | -1.6774 |
| Bottom | 1.482 | 201] 1.5 [DL + LL] | 6352.3818 | -73.5508 | -14.4618 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6288.6131 | -1.6774 | -3.9884 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6352.3818 | -14.4618 | -3.9884 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.535 | 201] 1.5 [DL + LL] | 6594.548 | 73.0522 | -10.5142 |
| Bottom | 1.549 | 201] 1.5 [DL + LL] | 6658.3167 | -72.4104 | 6.744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6594.548 | -10.5142 | 5.4922 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6658.3167 | 6.744 | 5.4922 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.607 | 201] 1.5 [DL + LL] | 6908.9976 | 74.8189 | 1.844 |
| Bottom | 1.625 | 201] 1.5 [DL + LL] | 6974.7907 | -78.8262 | -26.0654 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6908.9976 | 1.844 | -8.5976 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6974.7907 | -26.0654 | -8.5976 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.025 | 201] 1.5 [DL + LL] | 7204.9535 | 237.7775 | 36.4266 |
| Bottom | 2.052 | 201] 1.5 [DL + LL] | 7289.9784 | -240.2773 | -52.8517 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7204.9535 | 36.4266 | -21.2947 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7289.9784 | -52.8517 | -21.2947 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.006 | 201] 1.5 [DL + LL] | 7462.042 | 218.1426 | 51.198 |
| Bottom | 2.016 | 201] 1.5 [DL + LL] | 7543.4229 | -220.3345 | -14.1664 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7462.042 | 51.198 | -16.2837 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7543.4229 | -14.1664 | -16.2837 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.723 | 201] 1.5 [DL + LL] | 1718.8777 | 23.6006 | -239.6529 |
| Bottom | 0.629 | 201] 1.5 [DL + LL] | 1761.3901 | -20.2995 | 6.6922 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1718.8777 | -239.6529 | 77.9362 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1761.3901 | 6.6922 | 77.9362 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.697 | 201] 1.5 [DL + LL] | 1932.2785 | 19.4593 | 78.1392 |
| Bottom | 0.702 | 201] 1.5 [DL + LL] | 1974.7909 | -20.1991 | -32.9072 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1932.2785 | 78.1392 | -35.6058 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1974.7909 | -32.9072 | -35.6058 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.763 | 201] 1.5 [DL + LL] | 2147.8885 | 20.8443 | 42.339 |
| Bottom | 0.774 | 201] 1.5 [DL + LL] | 2190.401 | -20.8353 | -36.2186 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2147.8885 | 42.339 | -25.266 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2190.401 | -36.2186 | -25.266 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.834 | 201] 1.5 [DL + LL] | 2365.0368 | 22.0508 | 40.0391 |
| Bottom | 0.848 | 201] 1.5 [DL + LL] | 2407.5493 | -21.8412 | -35.6286 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2365.0368 | 40.0391 | -24.3649 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2407.5493 | -35.6286 | -24.3649 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.909 | 201] 1.5 [DL + LL] | 2583.4878 | 22.8638 | 41.2222 |
| Bottom | 0.924 | 201] 1.5 [DL + LL] | 2626.0003 | -22.6469 | -35.7201 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2583.4878 | 41.2222 | -24.781 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2626.0003 | -35.7201 | -24.781 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.985 | 201] 1.5 [DL + LL] | 2802.9355 | 23.5363 | 41.5353 |
| Bottom | 1 | 201] 1.5 [DL + LL] | 2845.448 | -23.2831 | -35.9267 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2802.9355 | 41.5353 | -24.9522 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2845.448 | -35.9267 | -24.9522 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.998 | 201] 1.5 [DL + LL] | 3023.0781 | 24.0897 | 41.4766 |
| Bottom | 1.012 | 201] 1.5 [DL + LL] | 3065.5905 | -23.7745 | -36.1592 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3023.0781 | 41.4766 | -25.0108 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3065.5905 | -36.1592 | -25.0108 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.07 | 201] 1.5 [DL + LL] | 3243.6151 | 24.5386 | 41.0948 |
| Bottom | 1.083 | 201] 1.5 [DL + LL] | 3286.1276 | -24.1282 | -36.6131 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3243.6151 | 41.0948 | -25.0366 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3286.1276 | -36.6131 | -25.0366 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.171 | 201] 1.5 [DL + LL] | 3464.2394 | 24.9137 | 40.1404 |
| Bottom | 1.185 | 201] 1.5 [DL + LL] | 3506.7518 | -24.4737 | -36.2982 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3464.2394 | 40.1404 | -24.6388 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3506.7518 | -36.2982 | -24.6388 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.244 | 201] 1.5 [DL + LL] | 3684.6267 | 25.0284 | 39.6107 |
| Bottom | 1.257 | 201] 1.5 [DL + LL] | 3727.1392 | -24.085 | -34.2209 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3684.6267 | 39.6107 | -23.8129 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3727.1392 | -34.2209 | -23.8129 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.101 | 201] 1.5 [DL + LL] | 3904.6068 | 26.0862 | 40.5658 |
| Bottom | 1.108 | 201] 1.5 [DL + LL] | 3947.1192 | -24.5907 | -79.4008 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3904.6068 | 40.5658 | -38.5261 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3947.1192 | -79.4008 | -38.5261 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.167 | 201] 1.5 [DL + LL] | 4124.706 | 27.402 | -8.2762 |
| Bottom | 1.192 | 201] 1.5 [DL + LL] | 4167.2184 | -31.0466 | 228.9992 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4124.706 | -8.2762 | 74.9953 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4167.2184 | 228.9992 | 74.9953 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.303 | 201] 1.5 [DL + LL] | 4356.7934 | 85.1586 | -925.9281 |
| Bottom | 1.069 | 201] 1.5 [DL + LL] | 4420.5621 | -74.1216 | -16.8569 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4356.7934 | -925.9281 | 288.4934 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4420.5621 | -16.8569 | 288.4934 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.139 | 201] 1.5 [DL + LL] | 4627.1376 | 79.4061 | 84.124 |
| Bottom | 1.13 | 201] 1.5 [DL + LL] | 4690.9062 | -77.3163 | -13.5899 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4627.1376 | 84.124 | -31.5047 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4690.9062 | -13.5899 | -31.5047 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.182 | 201] 1.5 [DL + LL] | 4895.3338 | 74.8497 | 85.3508 |
| Bottom | 1.183 | 201] 1.5 [DL + LL] | 4959.1025 | -74.5296 | -39.2122 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4895.3338 | 85.3508 | -39.9109 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4959.1025 | -39.2122 | -39.9109 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.226 | 201] 1.5 [DL + LL] | 5160.6473 | 74.0271 | 57.8344 |
| Bottom | 1.231 | 201] 1.5 [DL + LL] | 5224.416 | -72.9693 | -37.2293 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5160.6473 | 57.8344 | -30.5069 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5224.416 | -37.2293 | -30.5069 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.276 | 201] 1.5 [DL + LL] | 5423.5635 | 72.9179 | 57.4463 |
| Bottom | 1.287 | 201] 1.5 [DL + LL] | 5487.3322 | -71.6431 | -36.7215 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5423.5635 | 57.4463 | -30.1915 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5487.3322 | -36.7215 | -30.1915 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.33 | 201] 1.5 [DL + LL] | 5684.1369 | 71.6782 | 55.5557 |
| Bottom | 1.343 | 201] 1.5 [DL + LL] | 5747.9055 | -70.1531 | -38.4463 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5684.1369 | 55.5557 | -30.1075 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5747.9055 | -38.4463 | -30.1075 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.386 | 201] 1.5 [DL + LL] | 5942.2297 | 70.6656 | 51.1583 |
| Bottom | 1.4 | 201] 1.5 [DL + LL] | 6005.9983 | -69.2672 | -40.4798 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5942.2297 | 51.1583 | -29.3367 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6005.9983 | -40.4798 | -29.3367 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.441 | 201] 1.5 [DL + LL] | 6197.5685 | 68.6831 | 46.0586 |
| Bottom | 1.452 | 201] 1.5 [DL + LL] | 6261.3372 | -64.9667 | -36.795 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6197.5685 | 46.0586 | -26.5405 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6261.3372 | -36.795 | -26.5405 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.501 | 201] 1.5 [DL + LL] | 6450.4069 | 72.2217 | 46.5436 |
| Bottom | 1.526 | 201] 1.5 [DL + LL] | 6516.1999 | -81.4818 | -14.9591 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6450.4069 | 46.5436 | -19.1286 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6516.1999 | -14.9591 | -19.1286 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.889 | 201] 1.5 [DL + LL] | 6725.9559 | 220.2608 | 50.8274 |
| Bottom | 1.905 | 201] 1.5 [DL + LL] | 6810.9808 | -222.7605 | 25.4986 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6725.9559 | 50.8274 | -6.0673 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6810.9808 | 25.4986 | -6.0673 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.842 | 201] 1.5 [DL + LL] | 6957.2765 | 196.2205 | 36.6477 |
| Bottom | 1.87 | 201] 1.5 [DL + LL] | 7038.6574 | -198.4124 | -60.2191 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6957.2765 | 36.6477 | -23.9611 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7038.6574 | -60.2191 | -23.9611 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.264 | 201] 1.5 [DL + LL] | 1390.0021 | -102.5291 | 237.1102 |
| Bottom | 0.92 | 201] 1.5 [DL + LL] | 1432.5145 | 88.9593 | -27.9578 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1390.0021 | 237.1102 | -84.5274 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1432.5145 | -27.9578 | -84.5274 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.874 | 201] 1.5 [DL + LL] | 1678.8017 | -78.1852 | 8.1167 |
| Bottom | 0.904 | 201] 1.5 [DL + LL] | 1721.3141 | 80.8916 | -12.1755 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1678.8017 | 8.1167 | -6.7811 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1721.3141 | -12.1755 | -6.7811 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.974 | 201] 1.5 [DL + LL] | 1964.4165 | -82.3745 | 25.2275 |
| Bottom | 0.976 | 201] 1.5 [DL + LL] | 2006.9289 | 81.8865 | -15.5139 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1964.4165 | 25.2275 | -13.3078 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2006.9289 | -15.5139 | -13.3078 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.042 | 201] 1.5 [DL + LL] | 2249.1154 | -81.2608 | 23.8985 |
| Bottom | 1.05 | 201] 1.5 [DL + LL] | 2291.6278 | 81.3201 | -16.6176 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2249.1154 | 23.8985 | -13.2606 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2291.6278 | -16.6176 | -13.2606 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.09 | 201] 1.5 [DL + LL] | 2533.1068 | -81.3461 | 24.2272 |
| Bottom | 1.097 | 201] 1.5 [DL + LL] | 2575.6193 | 81.2794 | -17.3369 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2533.1068 | 24.2272 | -13.6147 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2575.6193 | -17.3369 | -13.6147 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.164 | 201] 1.5 [DL + LL] | 2816.6105 | -81.2472 | 24.6219 |
| Bottom | 1.171 | 201] 1.5 [DL + LL] | 2859.123 | 81.2385 | -17.9766 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2816.6105 | 24.6219 | -13.9593 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2859.123 | -17.9766 | -13.9593 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.225 | 201] 1.5 [DL + LL] | 3099.823 | -81.2853 | 24.8071 |
| Bottom | 1.236 | 201] 1.5 [DL + LL] | 3142.3354 | 81.2955 | -18.4924 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3099.823 | 24.8071 | -14.1937 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3142.3354 | -18.4924 | -14.1937 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.309 | 201] 1.5 [DL + LL] | 3382.9531 | -81.401 | 24.827 |
| Bottom | 1.319 | 201] 1.5 [DL + LL] | 3425.4656 | 81.4291 | -19.0405 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3382.9531 | 24.827 | -14.3824 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3425.4656 | -19.0405 | -14.3824 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.354 | 201] 1.5 [DL + LL] | 3666.2128 | -81.6137 | 24.4986 |
| Bottom | 1.365 | 201] 1.5 [DL + LL] | 3708.7252 | 81.7239 | -19.5311 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3666.2128 | 24.4986 | -14.4413 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3708.7252 | -19.5311 | -14.4413 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.435 | 201] 1.5 [DL + LL] | 3949.7582 | -81.7684 | 23.8475 |
| Bottom | 1.444 | 201] 1.5 [DL + LL] | 3992.2706 | 81.5411 | -19.4374 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3949.7582 | 23.8475 | -14.2128 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3992.2706 | -19.4374 | -14.2128 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.52 | 201] 1.5 [DL + LL] | 4233.9764 | -82.9646 | 23.7223 |
| Bottom | 1.537 | 201] 1.5 [DL + LL] | 4276.4888 | 83.5829 | 30.8906 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4233.9764 | 23.7223 | 1.897 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4276.4888 | 30.8906 | 1.897 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.618 | 201] 1.5 [DL + LL] | 4520.7821 | -81.45 | 80.2852 |
| Bottom | 1.691 | 201] 1.5 [DL + LL] | 4563.2946 | 79.4291 | -288.0212 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4520.7821 | 80.2852 | -117.3573 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4563.2946 | -288.0212 | -117.3573 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.429 | 201] 1.5 [DL + LL] | 4763.9078 | -83.4097 | 1140.6699 |
| Bottom | 1.176 | 201] 1.5 [DL + LL] | 4827.6764 | 79.7775 | -63.5097 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4763.9078 | 1140.6699 | -383.0105 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4827.6764 | -63.5097 | -383.0105 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.217 | 201] 1.5 [DL + LL] | 5033.2165 | -82.1272 | 39.8473 |
| Bottom | 1.233 | 201] 1.5 [DL + LL] | 5096.9851 | 80.2272 | -75.376 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5033.2165 | 39.8473 | -36.8219 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5096.9851 | -75.376 | -36.8219 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.255 | 201] 1.5 [DL + LL] | 5300.6979 | -78.3335 | 20.9356 |
| Bottom | 1.272 | 201] 1.5 [DL + LL] | 5364.4665 | 77.8105 | -40.0351 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5300.6979 | 20.9356 | -19.7077 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5364.4665 | -40.0351 | -19.7077 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.311 | 201] 1.5 [DL + LL] | 5566.2956 | -76.2211 | 50.2664 |
| Bottom | 1.322 | 201] 1.5 [DL + LL] | 5630.0643 | 75.4523 | -33.7362 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5566.2956 | 50.2664 | -27.0246 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5630.0643 | -33.7362 | -27.0246 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.365 | 201] 1.5 [DL + LL] | 5830.6217 | -74.2132 | 52.8379 |
| Bottom | 1.379 | 201] 1.5 [DL + LL] | 5894.3904 | 73.2446 | -33.3966 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5830.6217 | 52.8379 | -27.6996 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5894.3904 | -33.3966 | -27.6996 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.421 | 201] 1.5 [DL + LL] | 6093.5811 | -72.0197 | 49.5405 |
| Bottom | 1.435 | 201] 1.5 [DL + LL] | 6157.3498 | 71.0169 | -33.5744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6093.5811 | 49.5405 | -26.6754 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6157.3498 | -33.5744 | -26.6754 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.477 | 201] 1.5 [DL + LL] | 6355.0379 | -69.6557 | 45.2099 |
| Bottom | 1.491 | 201] 1.5 [DL + LL] | 6418.8066 | 68.2976 | -34.2214 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6355.0379 | 45.2099 | -25.4806 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6418.8066 | -34.2214 | -25.4806 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.534 | 201] 1.5 [DL + LL] | 6615.0202 | -67.8348 | 39.816 |
| Bottom | 1.547 | 201] 1.5 [DL + LL] | 6678.7889 | 66.7784 | -33.7379 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6615.0202 | 39.816 | -23.6027 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6678.7889 | -33.7379 | -23.6027 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.588 | 201] 1.5 [DL + LL] | 6873.2452 | -64.1506 | 35.2592 |
| Bottom | 1.603 | 201] 1.5 [DL + LL] | 6939.0383 | 63.2574 | -10.726 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6873.2452 | 35.2592 | -14.3818 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6939.0383 | -10.726 | -14.3818 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.017 | 201] 1.5 [DL + LL] | 7129.9465 | -237.947 | 52.3143 |
| Bottom | 2.031 | 201] 1.5 [DL + LL] | 7214.9714 | 240.4467 | -18.3128 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7129.9465 | 52.3143 | -16.9122 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7214.9714 | -18.3128 | -16.9122 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.89 | 201] 1.5 [DL + LL] | 7457.4214 | -177.347 | 45.0313 |
| Bottom | 1.908 | 201] 1.5 [DL + LL] | 7538.8023 | 179.539 | -24.2134 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7457.4214 | 45.0313 | -17.2044 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7538.8023 | -24.2134 | -17.2044 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.694 | 201] 1.5 [DL + LL] | 522.2295 | 217.3869 | 361.0779 |
| Bottom | 1.301 | 201] 1.5 [DL + LL] | 809.4995 | -122.7877 | 69.9126 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 522.2295 | 361.0779 | -66.8937 | 3159.6 | 4172.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 809.4995 | 69.9126 | -66.8937 | 3159.6 | 4172.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.05 | 201] 1.5 [DL + LL] | 1198.2073 | 124.7542 | 1065.8931 |
| Bottom | 4.341 | 201] 1.5 [DL + LL] | 1392.131 | -255.1618 | 988.7967 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1198.2073 | 1065.8931 | -26.699 | 3500.4 | 4512.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1392.131 | 988.7967 | -26.699 | 3500.4 | 4512.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.672 | 201] 1.5 [DL + LL] | 2684.3161 | 317.2664 | 1632.7458 |
| Bottom | 0.728 | 201] 1.5 [DL + LL] | 2897.5485 | -210.273 | 1321.6889 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2684.3161 | 1632.7458 | -96.5492 | 3440.4 | 4452.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2897.5485 | 1321.6889 | -95.7408 | 3440.4 | 4452.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.46 | 201] 1.5 [DL + LL] | 3204.5695 | 148.9248 | 1444.6663 |
| Bottom | 0.564 | 201] 1.5 [DL + LL] | 3431.3133 | -201.5532 | 1128.2585 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3204.5695 | 1444.6663 | -85.9132 | 3464.4 | 4476.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3431.3133 | 1128.2585 | -86.0307 | 3464.4 | 4476.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.568 | 201] 1.5 [DL + LL] | 3802.9102 | 204.0277 | 1189.5825 |
| Bottom | 0.557 | 201] 1.5 [DL + LL] | 4033.0206 | -208.1338 | 936.2352 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3802.9102 | 1189.5825 | -64.7216 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4033.0206 | 936.2352 | -64.5273 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.535 | 201] 1.5 [DL + LL] | 4405.9895 | 194.9111 | 1003.0268 |
| Bottom | 0.551 | 201] 1.5 [DL + LL] | 4636.4424 | -205.4579 | 828.7176 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4405.9895 | 1003.0268 | -39.442 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4636.4424 | 828.7176 | -39.2535 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.548 | 201] 1.5 [DL + LL] | 5009.7951 | 191.7616 | 898.8703 |
| Bottom | 0.567 | 201] 1.5 [DL + LL] | 5240.6263 | -202.605 | 770.805 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5009.7951 | 898.8703 | -24.5073 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5240.6263 | 770.805 | -24.373 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.565 | 201] 1.5 [DL + LL] | 5613.9297 | 189.1207 | 843.041 |
| Bottom | 0.574 | 201] 1.5 [DL + LL] | 5845.0824 | -188.4684 | 742.2909 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5613.9297 | 843.041 | -15.601 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5845.0824 | 742.2909 | -15.529 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.607 | 201] 1.5 [DL + LL] | 6229.8789 | 193.3644 | 902.9334 |
| Bottom | 0.615 | 201] 1.5 [DL + LL] | 6460.6324 | -202.8558 | 488.0016 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6229.8789 | 902.9334 | -115.6141 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6460.6324 | 488.0016 | -115.5673 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.619 | 201] 1.5 [DL + LL] | 6855.3706 | 179.8413 | 686.6401 |
| Bottom | 0.641 | 201] 1.5 [DL + LL] | 7086.5403 | -196.737 | 435.5502 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6855.3706 | 686.6401 | -63.3154 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7086.5403 | 435.5502 | -63.2876 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.654 | 201] 1.5 [DL + LL] | 7480.0423 | 181.7766 | 631.8072 |
| Bottom | 0.673 | 201] 1.5 [DL + LL] | 7711.7007 | -195.437 | 388.6884 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7480.0423 | 631.8072 | -60.4415 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7711.7007 | 388.6884 | -60.4108 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.688 | 201] 1.5 [DL + LL] | 8104.5797 | 178.4194 | 586.1328 |
| Bottom | 0.71 | 201] 1.5 [DL + LL] | 8336.7532 | -193.6275 | 346.1088 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8104.5797 | 586.1328 | -59.0854 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8336.7532 | 346.1088 | -59.0576 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.724 | 201] 1.5 [DL + LL] | 8728.1542 | 174.441 | 543.0957 |
| Bottom | 0.747 | 201] 1.5 [DL + LL] | 8960.841 | -191.0539 | 309.1867 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8728.1542 | 543.0957 | -56.7652 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8960.841 | 309.1867 | -56.7428 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.76 | 201] 1.5 [DL + LL] | 9350.2142 | 170.39 | 504.9155 |
| Bottom | 0.783 | 201] 1.5 [DL + LL] | 9583.4045 | -187.919 | 280.5653 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9350.2142 | 504.9155 | -53.3543 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9583.4045 | 280.5653 | -53.3377 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.795 | 201] 1.5 [DL + LL] | 9970.1968 | 166.0611 | 474.2294 |
| Bottom | 0.819 | 201] 1.5 [DL + LL] | 10203.8702 | -184.3126 | 261.2355 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9970.1968 | 474.2294 | -49.3832 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10203.8702 | 261.2355 | -49.3717 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.83 | 201] 1.5 [DL + LL] | 10587.5534 | 161.3653 | 452.0985 |
| Bottom | 0.855 | 201] 1.5 [DL + LL] | 10821.6807 | -180.1711 | 249.4607 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10587.5534 | 452.0985 | -45.7454 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10821.6807 | 249.4607 | -45.7383 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.865 | 201] 1.5 [DL + LL] | 11201.7425 | 156.365 | 436.8419 |
| Bottom | 0.891 | 201] 1.5 [DL + LL] | 11436.2856 | -175.5888 | 239.4827 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11201.7425 | 436.8419 | -43.7405 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11436.2856 | 239.4827 | -43.7371 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.9 | 201] 1.5 [DL + LL] | 11812.2469 | 151.017 | 422.7607 |
| Bottom | 0.925 | 201] 1.5 [DL + LL] | 12047.1563 | -170.6644 | 216.3794 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11812.2469 | 422.7607 | -46.3035 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12047.1563 | 216.3794 | -46.3042 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.933 | 201] 1.5 [DL + LL] | 12418.4558 | 145.0363 | 394.7024 |
| Bottom | 0.955 | 201] 1.5 [DL + LL] | 12653.686 | -159.9831 | 186.6183 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12418.4558 | 394.7024 | -46.574 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12653.686 | 186.6183 | -46.5803 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.975 | 201] 1.5 [DL + LL] | 13019.4713 | 143.3067 | 359.0172 |
| Bottom | 0.995 | 201] 1.5 [DL + LL] | 13254.9432 | -151.4824 | 207.6601 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13019.4713 | 359.0172 | -28.3558 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13254.9432 | 207.6601 | -28.3797 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.018 | 201] 1.5 [DL + LL] | 13616.9039 | 143.7866 | 376.75 |
| Bottom | 1.042 | 201] 1.5 [DL + LL] | 13852.5496 | -166.7276 | 243.5214 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13616.9039 | 376.75 | -22.4343 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13852.5496 | 243.5214 | -22.4552 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.052 | 201] 1.5 [DL + LL] | 14211.2823 | 117.6622 | 416.9883 |
| Bottom | 1.081 | 201] 1.5 [DL + LL] | 14447.4474 | -155.2865 | 267.6451 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14211.2823 | 416.9883 | -27.0956 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14447.4474 | 267.6451 | -27.1236 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.087 | 201] 1.5 [DL + LL] | 14804.2113 | 120.5701 | 443.4158 |
| Bottom | 1.113 | 201] 1.5 [DL + LL] | 15040.8518 | -149.4551 | 238.5094 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14804.2113 | 443.4158 | -44.2895 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15040.8518 | 238.5094 | -44.3214 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.128 | 201] 1.5 [DL + LL] | 15395.7453 | 118.058 | 417.8847 |
| Bottom | 1.154 | 201] 1.5 [DL + LL] | 15632.8582 | -145.1643 | 228.6469 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15395.7453 | 417.8847 | -38.8821 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15632.8582 | 228.6469 | -38.9166 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.168 | 201] 1.5 [DL + LL] | 15985.3442 | 112.8688 | 410.8584 |
| Bottom | 1.194 | 201] 1.5 [DL + LL] | 16222.9155 | -140.6825 | 245.0509 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15985.3442 | 410.8584 | -31.0175 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16222.9155 | 245.0509 | -31.0531 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.208 | 201] 1.5 [DL + LL] | 16572.6025 | 107.0671 | 429.6946 |
| Bottom | 1.234 | 201] 1.5 [DL + LL] | 16810.6266 | -135.6857 | 291.8372 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16572.6025 | 429.6946 | -21.7063 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16810.6266 | 291.8372 | -21.7423 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.232 | 201] 1.5 [DL + LL] | 17157.1378 | 100.9941 | 478.6901 |
| Bottom | 1.258 | 201] 1.5 [DL + LL] | 17395.6097 | -129.8397 | 379.5855 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17157.1378 | 478.6901 | -8.9404 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17395.6097 | 379.5855 | -8.9743 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.27 | 201] 1.5 [DL + LL] | 17738.5871 | 94.867 | 568.6613 |
| Bottom | 1.295 | 201] 1.5 [DL + LL] | 17977.5018 | -118.6118 | 499.3058 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17738.5871 | 568.6613 | 1.0166 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17977.5018 | 499.3058 | 0.9881 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.31 | 201] 1.5 [DL + LL] | 18316.341 | 93.0184 | 690.1267 |
| Bottom | 1.33 | 201] 1.5 [DL + LL] | 18562.1732 | -100.6582 | 548.7627 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18316.341 | 690.1267 | -20.66 | 3428.4 | 4440.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18562.1732 | 548.7627 | -20.6284 | 3428.4 | 4440.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.637 | 201] 1.5 [DL + LL] | 19062.9199 | 519.077 | 285.1234 |
| Bottom | 1.669 | 201] 1.5 [DL + LL] | 19371.9178 | -528.1616 | 423.784 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 19062.9199 | 285.1234 | 51.3453 | 3200.4 | 4212.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 19371.9178 | 423.784 | 51.2666 | 3200.4 | 4212.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.762 | 201] 1.5 [DL + LL] | 19908.5664 | 592.9146 | -172.8427 |
| Bottom | 1.801 | 201] 1.5 [DL + LL] | 20206.5355 | -600.9401 | -506.068 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 19908.5664 | -172.8427 | -63.2366 | 3243.6 | 4256.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 20206.5355 | -506.068 | -63.1272 | 3243.6 | 4256.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.507 | 201] 1.5 [DL + LL] | 552.9395 | -213.5403 | 430.9703 |
| Bottom | 0.327 | 201] 1.5 [DL + LL] | 840.2095 | 78.9915 | 209.2245 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 552.9395 | 430.9703 | -50.9706 | 3159.6 | 4172.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 840.2095 | 209.2245 | -50.9706 | 3159.6 | 4172.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.162 | 201] 1.5 [DL + LL] | 1091.4241 | -42.5673 | 806.8075 |
| Bottom | 0.167 | 201] 1.5 [DL + LL] | 1285.3478 | 53.5411 | 539.7713 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1091.4241 | 806.8075 | -90.9057 | 3500.4 | 4512.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1285.3478 | 539.7713 | -90.9057 | 3500.4 | 4512.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.133 | 201] 1.5 [DL + LL] | 1849.5163 | -2.983 | 365.1415 |
| Bottom | 0.41 | 201] 1.5 [DL + LL] | 2067.2341 | 151.7826 | 327.6112 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1849.5163 | 365.1415 | -6.5831 | 3440.4 | 4452.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2067.2341 | 327.6112 | -7.3915 | 3440.4 | 4452.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.401 | 201] 1.5 [DL + LL] | 2406.0939 | -150.5605 | 575.023 |
| Bottom | 0.495 | 201] 1.5 [DL + LL] | 2654.483 | 186.7032 | 428.6649 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2406.0939 | 575.023 | -14.5901 | 3464.4 | 4476.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2654.483 | 428.6649 | -14.4725 | 3464.4 | 4476.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.449 | 201] 1.5 [DL + LL] | 3050.4316 | -173.1366 | 594.0817 |
| Bottom | 0.469 | 201] 1.5 [DL + LL] | 3302.0278 | 184.3343 | 530.1353 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3050.4316 | 594.0817 | 11.7314 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3302.0278 | 530.1353 | 11.5372 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.456 | 201] 1.5 [DL + LL] | 3694.9797 | -172.865 | 689.53 |
| Bottom | 0.48 | 201] 1.5 [DL + LL] | 3946.2334 | 185.281 | 600.5828 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3694.9797 | 689.53 | 3.4222 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3946.2334 | 600.5828 | 3.2337 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.477 | 201] 1.5 [DL + LL] | 4336.2643 | -168.878 | 754.1134 |
| Bottom | 0.503 | 201] 1.5 [DL + LL] | 4587.1396 | 182.8696 | 638.2391 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4336.2643 | 754.1134 | -5.5167 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4587.1396 | 638.2391 | -5.651 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.502 | 201] 1.5 [DL + LL] | 4974.6029 | -167.3383 | 787.8003 |
| Bottom | 0.517 | 201] 1.5 [DL + LL] | 5225.1568 | 172.8163 | 641.3598 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4974.6029 | 787.8003 | -15.5444 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5225.1568 | 641.3598 | -15.6164 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.541 | 201] 1.5 [DL + LL] | 5620.5763 | -166.3265 | 870.7559 |
| Bottom | 0.554 | 201] 1.5 [DL + LL] | 5871.5294 | 180.828 | 417.2662 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5620.5763 | 870.7559 | -112.7548 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5871.5294 | 417.2662 | -112.8017 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.559 | 201] 1.5 [DL + LL] | 6271.593 | -156.0212 | 679.5934 |
| Bottom | 0.582 | 201] 1.5 [DL + LL] | 6522.1299 | 175.1988 | 368.1611 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6271.593 | 679.5934 | -68.0181 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6522.1299 | 368.1611 | -68.0459 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.596 | 201] 1.5 [DL + LL] | 6918.9806 | -158.3658 | 623.3563 |
| Bottom | 0.618 | 201] 1.5 [DL + LL] | 7169.0288 | 174.224 | 333.0545 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6918.9806 | 623.3563 | -61.7001 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7169.0288 | 333.0545 | -61.7308 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.634 | 201] 1.5 [DL + LL] | 7563.4618 | -155.7651 | 584.7975 |
| Bottom | 0.657 | 201] 1.5 [DL + LL] | 7812.9949 | 173.0035 | 300.734 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7563.4618 | 584.7975 | -60.1212 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7812.9949 | 300.734 | -60.149 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.672 | 201] 1.5 [DL + LL] | 8204.4743 | -152.5254 | 547.997 |
| Bottom | 0.696 | 201] 1.5 [DL + LL] | 8453.4941 | 171.1033 | 270.6387 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8204.4743 | 547.997 | -58.3858 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8453.4941 | 270.6387 | -58.4081 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.709 | 201] 1.5 [DL + LL] | 8841.6936 | -149.2504 | 513.1184 |
| Bottom | 0.734 | 201] 1.5 [DL + LL] | 9090.2098 | 168.7266 | 245.5445 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8841.6936 | 513.1184 | -55.6592 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9090.2098 | 245.5445 | -55.6758 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.746 | 201] 1.5 [DL + LL] | 9474.7537 | -145.6981 | 482.8381 |
| Bottom | 0.772 | 201] 1.5 [DL + LL] | 9722.7869 | 165.9343 | 226.9211 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9474.7537 | 482.8381 | -52.3169 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9722.7869 | 226.9211 | -52.3283 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.783 | 201] 1.5 [DL + LL] | 10103.281 | -141.7725 | 458.6159 |
| Bottom | 0.809 | 201] 1.5 [DL + LL] | 10350.8601 | 162.6479 | 213.3429 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10103.281 | 458.6159 | -49.2678 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10350.8601 | 213.3429 | -49.2749 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.819 | 201] 1.5 [DL + LL] | 10726.8882 | -137.5195 | 439.0127 |
| Bottom | 0.846 | 201] 1.5 [DL + LL] | 10974.0517 | 158.9643 | 199.0442 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10726.8882 | 439.0127 | -47.8784 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10974.0517 | 199.0442 | -47.8818 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.855 | 201] 1.5 [DL + LL] | 11345.1932 | -132.8487 | 418.2695 |
| Bottom | 0.881 | 201] 1.5 [DL + LL] | 11591.9904 | 154.8743 | 170.0797 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11345.1932 | 418.2695 | -50.74 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11591.9904 | 170.0797 | -50.7394 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.894 | 201] 1.5 [DL + LL] | 11957.7243 | -127.6299 | 382.1429 |
| Bottom | 0.918 | 201] 1.5 [DL + LL] | 12204.2006 | 145.226 | 135.3797 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11957.7243 | 382.1429 | -50.5068 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12204.2006 | 135.3797 | -50.5005 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 201] 1.5 [DL + LL] | 12563.7429 | -126.4801 | 339.4772 |
| Bottom | 0.959 | 201] 1.5 [DL + LL] | 12809.9777 | 137.9746 | 164.9081 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12563.7429 | 339.4772 | -27.7661 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12809.9777 | 164.9081 | -27.7422 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.98 | 201] 1.5 [DL + LL] | 13165.5963 | -126.7021 | 360.6719 |
| Bottom | 1.006 | 201] 1.5 [DL + LL] | 13411.6572 | 152.0119 | 232.725 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13165.5963 | 360.6719 | -13.0672 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13411.6572 | 232.725 | -13.0463 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.016 | 201] 1.5 [DL + LL] | 13763.1658 | -103.135 | 429.4979 |
| Bottom | 1.046 | 201] 1.5 [DL + LL] | 14008.7072 | 141.8799 | 261.7576 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13763.1658 | 429.4979 | -26.0176 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14008.7072 | 261.7576 | -25.9897 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.05 | 201] 1.5 [DL + LL] | 14357.2914 | -106.2455 | 457.6166 |
| Bottom | 1.078 | 201] 1.5 [DL + LL] | 14602.3575 | 136.5377 | 232.1149 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14357.2914 | 457.6166 | -44.6141 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14602.3575 | 232.1149 | -44.5822 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.092 | 201] 1.5 [DL + LL] | 14948.065 | -104.3901 | 428.4041 |
| Bottom | 1.119 | 201] 1.5 [DL + LL] | 15192.6586 | 132.8906 | 220.6356 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14948.065 | 428.4041 | -39.2506 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15192.6586 | 220.6356 | -39.2161 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.132 | 201] 1.5 [DL + LL] | 15534.9922 | -99.8366 | 416.5735 |
| Bottom | 1.159 | 201] 1.5 [DL + LL] | 15779.1275 | 129.0751 | 237.8238 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15534.9922 | 416.5735 | -30.2902 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15779.1275 | 237.8238 | -30.2546 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.172 | 201] 1.5 [DL + LL] | 16117.7103 | -94.7259 | 433.0084 |
| Bottom | 1.199 | 201] 1.5 [DL + LL] | 16361.3928 | 124.8084 | 287.6992 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16117.7103 | 433.0084 | -19.9058 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16361.3928 | 287.6992 | -19.8698 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.196 | 201] 1.5 [DL + LL] | 16695.8611 | -89.3235 | 481.9207 |
| Bottom | 1.223 | 201] 1.5 [DL + LL] | 16939.0958 | 119.6109 | 379.3426 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16695.8611 | 481.9207 | -6.5366 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16939.0958 | 379.3426 | -6.5026 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.234 | 201] 1.5 [DL + LL] | 17269.0927 | -84.0446 | 572.5343 |
| Bottom | 1.259 | 201] 1.5 [DL + LL] | 17511.8845 | 109.9551 | 502.6234 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17269.0927 | 572.5343 | 3.6977 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17511.8845 | 502.6234 | 3.7261 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.273 | 201] 1.5 [DL + LL] | 17836.7065 | -81.6001 | 694.6847 |
| Bottom | 1.293 | 201] 1.5 [DL + LL] | 18085.7282 | 88.1062 | 556.6477 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17836.7065 | 694.6847 | -17.3029 | 3428.4 | 4440.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18085.7282 | 556.6477 | -17.3346 | 3428.4 | 4440.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.687 | 201] 1.5 [DL + LL] | 18576.2337 | -586.1876 | 276.1981 |
| Bottom | 1.72 | 201] 1.5 [DL + LL] | 18886.9897 | 595.3238 | 447.7221 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18576.2337 | 276.1981 | 60.0817 | 3200.4 | 4212.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18886.9897 | 447.7221 | 60.1604 | 3200.4 | 4212.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.616 | 201] 1.5 [DL + LL] | 19452.7012 | -467.1871 | -239.82 |
| Bottom | 1.649 | 201] 1.5 [DL + LL] | 19750.8208 | 475.2167 | -539.5191 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 19452.7012 | -239.82 | -54.6981 | 3243.6 | 4256.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 19750.8208 | -539.5191 | -54.8075 | 3243.6 | 4256.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.207 | 201] 1.5 [DL + LL] | 1423.6676 | 96.7449 | 246.6037 |
| Bottom | 0.894 | 201] 1.5 [DL + LL] | 1466.18 | -84.3401 | -35.0077 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1423.6676 | 246.6037 | -89.7076 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1466.18 | -35.0077 | -89.7076 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.858 | 201] 1.5 [DL + LL] | 1706.8633 | 75.5945 | 3.4396 |
| Bottom | 0.891 | 201] 1.5 [DL + LL] | 1749.3758 | -77.659 | -15.3617 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1706.8633 | 3.4396 | -6.2328 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1749.3758 | -15.3617 | -6.2328 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.961 | 201] 1.5 [DL + LL] | 1987.421 | 79.3835 | 23.2385 |
| Bottom | 0.966 | 201] 1.5 [DL + LL] | 2029.9334 | -78.7419 | -17.39 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1987.421 | 23.2385 | -13.2002 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2029.9334 | -17.39 | -13.2002 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.032 | 201] 1.5 [DL + LL] | 2267.4269 | 78.5983 | 22.7349 |
| Bottom | 1.04 | 201] 1.5 [DL + LL] | 2309.9393 | -78.4571 | -17.8732 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2267.4269 | 22.7349 | -13.2172 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2309.9393 | -17.8732 | -13.2172 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.081 | 201] 1.5 [DL + LL] | 2547.0838 | 78.8621 | 23.4652 |
| Bottom | 1.088 | 201] 1.5 [DL + LL] | 2589.5962 | -78.6255 | -18.2861 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2547.0838 | 23.4652 | -13.5993 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2589.5962 | -18.2861 | -13.5993 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.155 | 201] 1.5 [DL + LL] | 2826.584 | 78.9672 | 24.0805 |
| Bottom | 1.162 | 201] 1.5 [DL + LL] | 2869.0965 | -78.7859 | -18.819 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2826.584 | 24.0805 | -13.9776 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2869.0965 | -18.819 | -13.9776 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.219 | 201] 1.5 [DL + LL] | 3106.1098 | 79.2099 | 24.3527 |
| Bottom | 1.229 | 201] 1.5 [DL + LL] | 3148.6223 | -79.0367 | -19.3831 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3106.1098 | 24.3527 | -14.2529 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3148.6223 | -19.3831 | -14.2529 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.302 | 201] 1.5 [DL + LL] | 3385.8593 | 79.5411 | 24.3182 |
| Bottom | 1.312 | 201] 1.5 [DL + LL] | 3428.3718 | -79.3608 | -20.1146 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3385.8593 | 24.3182 | -14.4823 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3428.3718 | -20.1146 | -14.4823 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.348 | 201] 1.5 [DL + LL] | 3666.0384 | 79.9932 | 23.7647 |
| Bottom | 1.358 | 201] 1.5 [DL + LL] | 3708.5509 | -79.8669 | -20.9738 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3666.0384 | 23.7647 | -14.5901 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3708.5509 | -20.9738 | -14.5901 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.428 | 201] 1.5 [DL + LL] | 3946.7985 | 80.3926 | 22.6047 |
| Bottom | 1.438 | 201] 1.5 [DL + LL] | 3989.311 | -79.8338 | -21.3222 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3946.7985 | 22.6047 | -14.3505 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3989.311 | -21.3222 | -14.3505 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.514 | 201] 1.5 [DL + LL] | 4228.5519 | 81.9957 | 21.7199 |
| Bottom | 1.53 | 201] 1.5 [DL + LL] | 4271.0644 | -82.457 | 27.5032 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4228.5519 | 21.7199 | 1.5016 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4271.0644 | 27.5032 | 1.5016 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.61 | 201] 1.5 [DL + LL] | 4513.169 | 80.2586 | 76.1308 |
| Bottom | 1.678 | 201] 1.5 [DL + LL] | 4555.6815 | -76.8235 | -288.5003 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4513.169 | 76.1308 | -116.1853 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4555.6815 | -288.5003 | -116.1853 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.415 | 201] 1.5 [DL + LL] | 4753.6288 | 81.0648 | 1134.4907 |
| Bottom | 1.167 | 201] 1.5 [DL + LL] | 4817.3975 | -77.1835 | -61.0302 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4753.6288 | 1134.4907 | -380.2797 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4817.3975 | -61.0302 | -380.2797 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.208 | 201] 1.5 [DL + LL] | 5020.0717 | 79.9021 | 38.2923 |
| Bottom | 1.224 | 201] 1.5 [DL + LL] | 5083.8404 | -77.8197 | -70.5729 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5020.0717 | 38.2923 | -34.8231 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5083.8404 | -70.5729 | -34.8231 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.247 | 201] 1.5 [DL + LL] | 5284.9203 | 76.2602 | 22.2665 |
| Bottom | 1.262 | 201] 1.5 [DL + LL] | 5348.689 | -75.5607 | -36.2516 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5284.9203 | 22.2665 | -18.937 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5348.689 | -36.2516 | -18.937 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.303 | 201] 1.5 [DL + LL] | 5548.0842 | 74.3124 | 51.2815 |
| Bottom | 1.316 | 201] 1.5 [DL + LL] | 5611.8529 | -73.3448 | -31.2069 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5548.0842 | 51.2815 | -26.5408 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5611.8529 | -31.2069 | -26.5408 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.358 | 201] 1.5 [DL + LL] | 5810.1741 | 72.4821 | 53.1571 |
| Bottom | 1.372 | 201] 1.5 [DL + LL] | 5873.9428 | -71.2828 | -31.9212 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5810.1741 | 53.1571 | -27.3223 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5873.9428 | -31.9212 | -27.3223 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.415 | 201] 1.5 [DL + LL] | 6071.1075 | 70.471 | 49.2111 |
| Bottom | 1.428 | 201] 1.5 [DL + LL] | 6134.8762 | -69.2076 | -32.943 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6071.1075 | 49.2111 | -26.3571 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6134.8762 | -32.943 | -26.3571 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.471 | 201] 1.5 [DL + LL] | 6330.7595 | 68.2924 | 44.3134 |
| Bottom | 1.484 | 201] 1.5 [DL + LL] | 6394.5282 | -66.628 | -34.0903 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6330.7595 | 44.3134 | -25.1417 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6394.5282 | -34.0903 | -25.1417 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.527 | 201] 1.5 [DL + LL] | 6589.1684 | 66.6905 | 38.6077 |
| Bottom | 1.54 | 201] 1.5 [DL + LL] | 6652.9371 | -65.276 | -33.6399 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6589.1684 | 38.6077 | -23.1784 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6652.9371 | -33.6399 | -23.1784 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.581 | 201] 1.5 [DL + LL] | 6846.0866 | 63.2718 | 34.2161 |
| Bottom | 1.596 | 201] 1.5 [DL + LL] | 6911.8797 | -62.1272 | -6.5915 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6846.0866 | 34.2161 | -12.779 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6911.8797 | -6.5915 | -12.779 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.833 | 201] 1.5 [DL + LL] | 7101.4936 | 180.7183 | 55.4835 |
| Bottom | 1.849 | 201] 1.5 [DL + LL] | 7186.5185 | -183.218 | -18.3992 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7101.4936 | 55.4835 | -17.659 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7186.5185 | -18.3992 | -17.659 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.014 | 201] 1.5 [DL + LL] | 7421.4826 | 223.2871 | 44.0879 |
| Bottom | 2.031 | 201] 1.5 [DL + LL] | 7502.8636 | -225.479 | -30.7005 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7421.4826 | 44.0879 | -18.5622 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7502.8636 | -30.7005 | -18.5622 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.113 | 201] 1.5 [DL + LL] | 1482.3581 | -90.9422 | 196.5623 |
| Bottom | 0.867 | 201] 1.5 [DL + LL] | 1524.8705 | 80.0288 | 22.5405 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1482.3581 | 196.5623 | -55.6658 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1524.8705 | 22.5405 | -55.6658 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.867 | 201] 1.5 [DL + LL] | 1764.2079 | -73.4865 | -16.4438 |
| Bottom | 0.885 | 201] 1.5 [DL + LL] | 1806.7204 | 74.3898 | 19.7471 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1764.2079 | -16.4438 | 11.1569 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1806.7204 | 19.7471 | 11.1569 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 201] 1.5 [DL + LL] | 2044.2121 | -73.5991 | -20.6331 |
| Bottom | 0.954 | 201] 1.5 [DL + LL] | 2086.7246 | 72.6934 | 24.9232 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2044.2121 | -20.6331 | 14.0857 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2086.7246 | 24.9232 | 14.0857 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.004 | 201] 1.5 [DL + LL] | 2322.0728 | -71.1602 | -16.0441 |
| Bottom | 1.017 | 201] 1.5 [DL + LL] | 2364.5852 | 70.469 | 24.0644 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2322.0728 | -16.0441 | 12.3329 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2364.5852 | 24.0644 | 12.3329 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.07 | 201] 1.5 [DL + LL] | 2597.883 | -69.3885 | -17.2567 |
| Bottom | 1.082 | 201] 1.5 [DL + LL] | 2640.3954 | 68.59 | 24.0316 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2597.883 | -17.2567 | 12.6908 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2640.3954 | 24.0316 | 12.6908 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.146 | 201] 1.5 [DL + LL] | 2871.7229 | -67.486 | -17.663 |
| Bottom | 1.159 | 201] 1.5 [DL + LL] | 2914.2354 | 66.6993 | 24.0244 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2871.7229 | -17.663 | 12.8049 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2914.2354 | 24.0244 | 12.8049 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.144 | 201] 1.5 [DL + LL] | 3143.6037 | -65.6449 | -18.0218 |
| Bottom | 1.155 | 201] 1.5 [DL + LL] | 3186.1162 | 64.8347 | 23.9928 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3143.6037 | -18.0218 | 12.9005 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3186.1162 | 23.9928 | 12.9005 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 201] 1.5 [DL + LL] | 3413.5183 | -63.8083 | -18.3824 |
| Bottom | 1.225 | 201] 1.5 [DL + LL] | 3456.0308 | 62.9917 | 23.7039 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3413.5183 | -18.3824 | 12.9186 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3456.0308 | 23.7039 | 12.9186 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.333 | 201] 1.5 [DL + LL] | 3681.4333 | -61.9029 | -19.0006 |
| Bottom | 1.344 | 201] 1.5 [DL + LL] | 3723.9458 | 61.0789 | 21.9181 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3681.4333 | -19.0006 | 12.5417 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3723.9458 | 21.9181 | 12.5417 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.406 | 201] 1.5 [DL + LL] | 3947.3104 | -59.9388 | -21.2519 |
| Bottom | 1.421 | 201] 1.5 [DL + LL] | 3989.8228 | 58.9461 | 32.0279 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3947.3104 | -21.2519 | 16.464 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3989.8228 | 32.0279 | 16.464 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.429 | 201] 1.5 [DL + LL] | 4211.0666 | -58.4325 | -11.0703 |
| Bottom | 1.449 | 201] 1.5 [DL + LL] | 4253.579 | 56.2396 | 66.6578 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4211.0666 | -11.0703 | 24.3832 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4253.579 | 66.6578 | 24.3832 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.511 | 201] 1.5 [DL + LL] | 4470.8116 | -58.3486 | 28.4198 |
| Bottom | 1.596 | 201] 1.5 [DL + LL] | 4513.3241 | 62.9657 | -266.3584 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4470.8116 | 28.4198 | -94.0213 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4513.3241 | -266.3584 | -94.0213 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.514 | 201] 1.5 [DL + LL] | 4753.0791 | -112.3676 | 797.7831 |
| Bottom | 1.295 | 201] 1.5 [DL + LL] | 4813.3413 | 101.2357 | 73.4139 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4753.0791 | 797.7831 | -230.7785 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4813.3413 | 73.4139 | -230.7785 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.331 | 201] 1.5 [DL + LL] | 5044.9487 | -100.227 | 27.296 |
| Bottom | 1.339 | 201] 1.5 [DL + LL] | 5105.2109 | 99.2501 | -19.7084 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5044.9487 | 27.296 | -15.059 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5105.2109 | -19.7084 | -15.059 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.392 | 201] 1.5 [DL + LL] | 5336.2336 | -96.9871 | -68.1614 |
| Bottom | 1.391 | 201] 1.5 [DL + LL] | 5396.4958 | 95.8438 | 24.1327 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5336.2336 | -68.1614 | 29.0115 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5396.4958 | 24.1327 | 29.0115 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.433 | 201] 1.5 [DL + LL] | 5625.7634 | -93.6501 | -27.5563 |
| Bottom | 1.444 | 201] 1.5 [DL + LL] | 5686.0256 | 92.1922 | 34.9827 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5625.7634 | -27.5563 | 19.5213 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5686.0256 | 34.9827 | 19.5213 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.482 | 201] 1.5 [DL + LL] | 5912.9108 | -90.7778 | -18.0344 |
| Bottom | 1.495 | 201] 1.5 [DL + LL] | 5973.1729 | 89.0376 | 33.5705 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5912.9108 | -18.0344 | 16.0842 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5973.1729 | 33.5705 | 16.0842 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.539 | 201] 1.5 [DL + LL] | 6197.6016 | -87.3541 | -20.7006 |
| Bottom | 1.55 | 201] 1.5 [DL + LL] | 6257.8637 | 85.4517 | 32.4285 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6197.6016 | -20.7006 | 16.6047 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6257.8637 | 32.4285 | 16.6047 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.601 | 201] 1.5 [DL + LL] | 6479.7872 | -84.0018 | -23.4424 |
| Bottom | 1.613 | 201] 1.5 [DL + LL] | 6540.0493 | 82.3606 | 33.9663 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6479.7872 | -23.4424 | 17.994 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6540.0493 | 33.9663 | 17.994 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.662 | 201] 1.5 [DL + LL] | 6759.4092 | -79.3828 | -23.7745 |
| Bottom | 1.672 | 201] 1.5 [DL + LL] | 6819.6713 | 75.0126 | 25.5899 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6759.4092 | -23.7745 | 15.4676 | 307.5208 | 602.1672 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6819.6713 | 25.5899 | 15.4676 | 307.5208 | 602.1672 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.73 | 201] 1.5 [DL + LL] | 7037.379 | -82.0929 | -33.7402 |
| Bottom | 1.755 | 201] 1.5 [DL + LL] | 7099.5542 | 94.7228 | -62.8891 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7037.379 | -33.7402 | -9.3021 | 293.5977 | 588.2441 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7099.5542 | -62.8891 | -9.3021 | 293.5977 | 588.2441 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.361 | 201] 1.5 [DL + LL] | 7534.9849 | -255.5391 | 172.5464 |
| Bottom | 2.376 | 201] 1.5 [DL + LL] | 7615.3344 | 257.9014 | -143.5097 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7534.9849 | 172.5464 | -75.4336 | 216.9042 | 511.5506 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7615.3344 | -143.5097 | -75.4336 | 216.9042 | 511.5506 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.234 | 201] 1.5 [DL + LL] | 8060.8325 | -193.5464 | 127.9863 |
| Bottom | 2.241 | 201] 1.5 [DL + LL] | 8137.7385 | 195.6178 | -47.9399 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8060.8325 | 127.9863 | -43.8138 | 226.6106 | 521.257 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8137.7385 | -47.9399 | -43.8138 | 226.6106 | 521.257 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.098 | 201] 1.5 [DL + LL] | 2649.528 | 43.731 | 311.5892 |
| Bottom | 1.008 | 201] 1.5 [DL + LL] | 2692.0404 | -41.6207 | 58.0074 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2649.528 | 311.5892 | -81.15 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2692.0404 | 58.0074 | -81.15 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.071 | 201] 1.5 [DL + LL] | 2855.8564 | 37.9434 | -164.8655 |
| Bottom | 1.076 | 201] 1.5 [DL + LL] | 2898.3688 | -38.3519 | 121.4296 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2855.8564 | -164.8655 | 90.3766 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2898.3688 | 121.4296 | 90.3766 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.13 | 201] 1.5 [DL + LL] | 3074.1636 | 39.1466 | -95.7108 |
| Bottom | 1.145 | 201] 1.5 [DL + LL] | 3116.676 | -38.6782 | 109.1882 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3074.1636 | -95.7108 | 64.5043 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3116.676 | 109.1882 | 64.5043 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.202 | 201] 1.5 [DL + LL] | 3302.0057 | 38.4802 | -99.252 |
| Bottom | 1.216 | 201] 1.5 [DL + LL] | 3344.5182 | -38.2264 | 104.9751 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3302.0057 | -99.252 | 64.3001 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3344.5182 | 104.9751 | 64.3001 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.193 | 201] 1.5 [DL + LL] | 3539.6915 | 37.9858 | -95.0922 |
| Bottom | 1.206 | 201] 1.5 [DL + LL] | 3582.204 | -37.6929 | 100.5205 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3539.6915 | -95.0922 | 61.5664 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3582.204 | 100.5205 | 61.5664 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.263 | 201] 1.5 [DL + LL] | 3787.1313 | 37.3881 | -91.2375 |
| Bottom | 1.276 | 201] 1.5 [DL + LL] | 3829.6438 | -37.0639 | 96.0866 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3787.1313 | -91.2375 | 58.9371 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3829.6438 | 96.0866 | 58.9371 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.339 | 201] 1.5 [DL + LL] | 4044.4761 | 36.7115 | -87.2665 |
| Bottom | 1.351 | 201] 1.5 [DL + LL] | 4086.9885 | -36.3513 | 91.6382 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4044.4761 | -87.2665 | 56.267 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4086.9885 | 91.6382 | 56.267 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.424 | 201] 1.5 [DL + LL] | 4311.9458 | 35.9415 | -83.1559 |
| Bottom | 1.437 | 201] 1.5 [DL + LL] | 4354.4582 | -35.5418 | 87.1518 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4311.9458 | -83.1559 | 53.5414 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4354.4582 | 87.1518 | 53.5414 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.512 | 201] 1.5 [DL + LL] | 4589.8728 | 35.1066 | -78.8385 |
| Bottom | 1.525 | 201] 1.5 [DL + LL] | 4632.3853 | -34.6361 | 82.8355 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4589.8728 | -78.8385 | 50.8064 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4632.3853 | 82.8355 | 50.8064 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.604 | 201] 1.5 [DL + LL] | 4878.6713 | 34.2653 | -74.0011 |
| Bottom | 1.618 | 201] 1.5 [DL + LL] | 4921.1838 | -33.9545 | 71.448 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4878.6713 | -74.0011 | 45.652 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4921.1838 | 71.448 | 45.652 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.698 | 201] 1.5 [DL + LL] | 5178.6492 | 32.5561 | -76.4438 |
| Bottom | 1.705 | 201] 1.5 [DL + LL] | 5221.1617 | -32.01 | 134.3861 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5178.6492 | -76.4438 | 66.4896 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5221.1617 | 134.3861 | 66.4896 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.806 | 201] 1.5 [DL + LL] | 5491.8484 | 32.0145 | 1.8004 |
| Bottom | 1.812 | 201] 1.5 [DL + LL] | 5534.3608 | -31.4399 | -259.3171 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5491.8484 | 1.8004 | -83.4427 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5534.3608 | -259.3171 | -83.4427 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.581 | 201] 1.5 [DL + LL] | 5799.6421 | 56.9804 | 1027.9183 |
| Bottom | 1.423 | 201] 1.5 [DL + LL] | 5859.8673 | -51.4699 | -38.4277 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5799.6421 | 1027.9183 | -339.314 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5859.8673 | -38.4277 | -339.314 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.473 | 201] 1.5 [DL + LL] | 6128.682 | 41.9421 | -100.7597 |
| Bottom | 1.494 | 201] 1.5 [DL + LL] | 6188.9073 | -43.8961 | 19.9755 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6128.682 | -100.7597 | 38.0161 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6188.9073 | 19.9755 | 38.0161 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.56 | 201] 1.5 [DL + LL] | 6466.5621 | 46.4385 | -35.9322 |
| Bottom | 1.574 | 201] 1.5 [DL + LL] | 6526.7873 | -45.7324 | 34.5874 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6466.5621 | -35.9322 | 21.9523 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6526.7873 | 34.5874 | 21.9523 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.643 | 201] 1.5 [DL + LL] | 6814.1111 | 46.3593 | -11.8231 |
| Bottom | 1.656 | 201] 1.5 [DL + LL] | 6874.3364 | -46.1459 | 26.8452 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6814.1111 | -11.8231 | 11.8686 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6874.3364 | 26.8452 | 11.8686 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.727 | 201] 1.5 [DL + LL] | 7171.8872 | 46.5807 | -8.7266 |
| Bottom | 1.741 | 201] 1.5 [DL + LL] | 7232.1125 | -46.4249 | 20.8328 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7171.8872 | -8.7266 | 9.014 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7232.1125 | 20.8328 | 9.014 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.814 | 201] 1.5 [DL + LL] | 7540.3486 | 46.7832 | -3.4899 |
| Bottom | 1.827 | 201] 1.5 [DL + LL] | 7600.5738 | -46.5462 | 14.4417 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7540.3486 | -3.4899 | 5.3591 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7600.5738 | 14.4417 | 5.3591 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.904 | 201] 1.5 [DL + LL] | 7920.1638 | 47.3557 | 1.9555 |
| Bottom | 1.918 | 201] 1.5 [DL + LL] | 7980.3891 | -47.6564 | 5.6749 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7920.1638 | 1.9555 | 0.8815 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7980.3891 | 5.6749 | 0.8815 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.994 | 201] 1.5 [DL + LL] | 8312.1755 | 46.1235 | 5.7666 |
| Bottom | 2.007 | 201] 1.5 [DL + LL] | 8372.4007 | -44.2502 | 6.0866 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8312.1755 | 5.7666 | -0.169 | 307.0456 | 601.5115 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8372.4007 | 6.0866 | -0.169 | 307.0456 | 601.5115 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.096 | 201] 1.5 [DL + LL] | 8717.9036 | 53.6498 | 20.1246 |
| Bottom | 2.122 | 201] 1.5 [DL + LL] | 8780.0407 | -63.8237 | -5.2163 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8717.9036 | 20.1246 | -7.9908 | 293.1589 | 587.6248 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8780.0407 | -5.2163 | -7.9908 | 293.1589 | 587.6248 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.672 | 201] 1.5 [DL + LL] | 9194.5002 | 291.3819 | 39.9549 |
| Bottom | 2.696 | 201] 1.5 [DL + LL] | 9274.8005 | -293.7427 | -42.0387 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9194.5002 | 39.9549 | -19.6146 | 216.6427 | 511.1087 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9274.8005 | -42.0387 | -19.6146 | 216.6427 | 511.1087 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.718 | 201] 1.5 [DL + LL] | 9754.0208 | 274.2584 | 64.4638 |
| Bottom | 2.732 | 201] 1.5 [DL + LL] | 9830.8796 | -276.3285 | -31.5928 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9754.0208 | 64.4638 | -23.8705 | 226.3288 | 520.7947 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9830.8796 | -31.5928 | -23.8705 | 226.3288 | 520.7947 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.958 | 201] 1.5 [DL + LL] | 2112.6112 | -52.4074 | 218.8061 |
| Bottom | 0.878 | 201] 1.5 [DL + LL] | 2155.0883 | 50.495 | 57.5364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2112.6112 | 218.8061 | -51.6162 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2155.0883 | 57.5364 | -51.6162 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.954 | 201] 1.5 [DL + LL] | 2352.1349 | -45.9884 | -143.5572 |
| Bottom | 0.953 | 201] 1.5 [DL + LL] | 2394.6119 | 46.6644 | 108.364 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2352.1349 | -143.5572 | 79.6128 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2394.6119 | 108.364 | 79.6128 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.005 | 201] 1.5 [DL + LL] | 2600.0967 | -47.2012 | -88.8493 |
| Bottom | 1.02 | 201] 1.5 [DL + LL] | 2642.5738 | 46.8652 | 99.3017 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2600.0967 | -88.8493 | 59.3318 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2642.5738 | 99.3017 | 59.3318 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.083 | 201] 1.5 [DL + LL] | 2854.5086 | -46.2981 | -91.5926 |
| Bottom | 1.097 | 201] 1.5 [DL + LL] | 2896.9856 | 46.1751 | 96.2938 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2854.5086 | -91.5926 | 59.2425 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2896.9856 | 96.2938 | 59.2425 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.09 | 201] 1.5 [DL + LL] | 3115.9793 | -45.5694 | -88.258 |
| Bottom | 1.103 | 201] 1.5 [DL + LL] | 3158.4563 | 45.3944 | 92.9536 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3115.9793 | -88.258 | 57.1155 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3158.4563 | 92.9536 | 57.1155 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.165 | 201] 1.5 [DL + LL] | 3384.7163 | -44.7082 | -85.0952 |
| Bottom | 1.178 | 201] 1.5 [DL + LL] | 3427.1933 | 44.4976 | 89.4149 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3384.7163 | -85.0952 | 54.9829 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3427.1933 | 89.4149 | 54.9829 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.242 | 201] 1.5 [DL + LL] | 3661.1137 | -43.734 | -81.8545 |
| Bottom | 1.255 | 201] 1.5 [DL + LL] | 3703.5907 | 43.4905 | 85.6908 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3661.1137 | -81.8545 | 52.7684 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3703.5907 | 85.6908 | 52.7684 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.321 | 201] 1.5 [DL + LL] | 3945.6024 | -42.6298 | -78.5016 |
| Bottom | 1.333 | 201] 1.5 [DL + LL] | 3988.0795 | 42.3569 | 81.7747 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3945.6024 | -78.5016 | 50.4582 | 158.1014 | 365.789 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3988.0795 | 81.7747 | 50.4582 | 158.1014 | 365.789 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.409 | 201] 1.5 [DL + LL] | 4238.6945 | -41.4176 | -74.9878 |
| Bottom | 1.421 | 201] 1.5 [DL + LL] | 4281.1715 | 41.0888 | 77.8649 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4238.6945 | -74.9878 | 48.0994 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4281.1715 | 77.8649 | 48.0994 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.504 | 201] 1.5 [DL + LL] | 4540.9584 | -40.1575 | -71.0447 |
| Bottom | 1.518 | 201] 1.5 [DL + LL] | 4583.4354 | 40.019 | 67.2542 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4540.9584 | -71.0447 | 43.4655 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4583.4354 | 67.2542 | 43.4655 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.601 | 201] 1.5 [DL + LL] | 4852.844 | -37.9484 | -73.9131 |
| Bottom | 1.609 | 201] 1.5 [DL + LL] | 4895.3211 | 37.5371 | 126.7969 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4852.844 | -73.9131 | 63.3361 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4895.3211 | 126.7969 | 63.3361 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.711 | 201] 1.5 [DL + LL] | 5176.4374 | -37.0619 | -0.5867 |
| Bottom | 1.729 | 201] 1.5 [DL + LL] | 5218.9144 | 37.0689 | -250.1984 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5176.4374 | -0.5867 | -79.7518 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5218.9144 | -250.1984 | -79.7518 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.523 | 201] 1.5 [DL + LL] | 5493.8864 | -65.0864 | 971.0947 |
| Bottom | 1.359 | 201] 1.5 [DL + LL] | 5554.1478 | 59.4217 | -32.9053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5493.8864 | 971.0947 | -319.4942 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5554.1478 | -32.9053 | -319.4942 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.412 | 201] 1.5 [DL + LL] | 5832.6927 | -48.9612 | -90.344 |
| Bottom | 1.431 | 201] 1.5 [DL + LL] | 5892.9541 | 51.0075 | 19.9476 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5832.6927 | -90.344 | 34.6928 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5892.9541 | 19.9476 | 34.6928 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.5 | 201] 1.5 [DL + LL] | 6179.4478 | -52.9186 | -31.07 |
| Bottom | 1.513 | 201] 1.5 [DL + LL] | 6239.7092 | 52.2656 | 32.8886 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6179.4478 | -31.07 | 19.8846 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6239.7092 | 32.8886 | 19.8846 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.583 | 201] 1.5 [DL + LL] | 6534.9712 | -52.1516 | -8.9577 |
| Bottom | 1.597 | 201] 1.5 [DL + LL] | 6595.2326 | 52.0221 | 25.1685 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6534.9712 | -8.9577 | 10.4455 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6595.2326 | 25.1685 | 10.4455 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.669 | 201] 1.5 [DL + LL] | 6899.8689 | -51.7026 | -6.1875 |
| Bottom | 1.682 | 201] 1.5 [DL + LL] | 6960.1303 | 51.6354 | 19.0775 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6899.8689 | -6.1875 | 7.671 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6960.1303 | 19.0775 | 7.671 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.756 | 201] 1.5 [DL + LL] | 7274.6615 | -51.2277 | -1.3402 |
| Bottom | 1.77 | 201] 1.5 [DL + LL] | 7334.9229 | 51.1005 | 12.5827 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7274.6615 | -1.3402 | 4.1072 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7334.9229 | 12.5827 | 4.1072 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.846 | 201] 1.5 [DL + LL] | 7660.0687 | -51.0656 | 3.7125 |
| Bottom | 1.861 | 201] 1.5 [DL + LL] | 7720.3301 | 51.4368 | 3.3441 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7660.0687 | 3.7125 | -0.3968 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7720.3301 | 3.3441 | -0.3968 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.937 | 201] 1.5 [DL + LL] | 8056.9693 | -49.2249 | 6.7993 |
| Bottom | 1.95 | 201] 1.5 [DL + LL] | 8117.2307 | 47.8015 | 5.5627 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8056.9693 | 6.7993 | -0.6469 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8117.2307 | 5.5627 | -0.6469 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.037 | 201] 1.5 [DL + LL] | 8465.392 | -54.0817 | 21.6874 |
| Bottom | 2.06 | 201] 1.5 [DL + LL] | 8527.5664 | 62.3144 | -18.3093 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8465.392 | 21.6874 | -12.4977 | 293.5889 | 588.2316 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8527.5664 | -18.3093 | -12.4977 | 293.5889 | 588.2316 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.463 | 201] 1.5 [DL + LL] | 8933.8239 | -242.8507 | 47.56 |
| Bottom | 2.481 | 201] 1.5 [DL + LL] | 9014.1725 | 245.2129 | -22.6529 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8933.8239 | 47.56 | -16.7822 | 216.8989 | 511.5417 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9014.1725 | -22.6529 | -16.7822 | 216.8989 | 511.5417 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.589 | 201] 1.5 [DL + LL] | 9527.8579 | -245.703 | 39.4946 |
| Bottom | 2.608 | 201] 1.5 [DL + LL] | 9604.7629 | 247.7744 | -26.9697 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9527.8579 | 39.4946 | -16.4799 | 226.6049 | 521.2477 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9604.7629 | -26.9697 | -16.4799 | 226.6049 | 521.2477 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.978 | 201] 1.5 [DL + LL] | 1446.5582 | 76.9237 | 184.1838 |
| Bottom | 0.772 | 201] 1.5 [DL + LL] | 1489.0352 | -67.1338 | 21.4708 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1446.5582 | 184.1838 | -51.9784 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1489.0352 | 21.4708 | -51.9784 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.804 | 201] 1.5 [DL + LL] | 1722.07 | 62.7741 | -24.507 |
| Bottom | 0.817 | 201] 1.5 [DL + LL] | 1764.547 | -63.4264 | 20.8874 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1722.07 | -24.507 | 14.1666 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1764.547 | 20.8874 | 14.1666 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.882 | 201] 1.5 [DL + LL] | 1996.8656 | 63.222 | -26.4268 |
| Bottom | 0.889 | 201] 1.5 [DL + LL] | 2039.3426 | -62.4659 | 26.8224 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1996.8656 | -26.4268 | 16.6132 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2039.3426 | 26.8224 | 16.6132 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.945 | 201] 1.5 [DL + LL] | 2270.323 | 61.79 | -20.7721 |
| Bottom | 0.956 | 201] 1.5 [DL + LL] | 2312.8 | -61.1469 | 26.2421 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2270.323 | -20.7721 | 14.6104 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2312.8 | 26.2421 | 14.6104 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.021 | 201] 1.5 [DL + LL] | 2542.4335 | 60.8091 | -21.284 |
| Bottom | 1.033 | 201] 1.5 [DL + LL] | 2584.9105 | -60.0632 | 26.2377 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2542.4335 | -21.284 | 14.7558 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2584.9105 | 26.2377 | 14.7558 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.099 | 201] 1.5 [DL + LL] | 2813.193 | 59.6792 | -21.2043 |
| Bottom | 1.111 | 201] 1.5 [DL + LL] | 2855.67 | -58.9221 | 26.0889 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2813.193 | -21.2043 | 14.672 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2855.67 | 26.0889 | 14.672 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.102 | 201] 1.5 [DL + LL] | 3082.5557 | 58.567 | -21.2393 |
| Bottom | 1.113 | 201] 1.5 [DL + LL] | 3125.0327 | -57.7619 | 25.7792 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3082.5557 | -21.2393 | 14.5776 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3125.0327 | 25.7792 | 14.5776 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.174 | 201] 1.5 [DL + LL] | 3350.4769 | 57.4304 | -21.4299 |
| Bottom | 1.184 | 201] 1.5 [DL + LL] | 3392.9539 | -56.5873 | 25.0928 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3350.4769 | -21.4299 | 14.4146 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3392.9539 | 25.0928 | 14.4146 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.294 | 201] 1.5 [DL + LL] | 3616.9048 | 56.2055 | -22.038 |
| Bottom | 1.304 | 201] 1.5 [DL + LL] | 3659.3818 | -55.3209 | 22.7554 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3616.9048 | -22.038 | 13.8552 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3659.3818 | 22.7554 | 13.8552 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.37 | 201] 1.5 [DL + LL] | 3881.8025 | 54.9008 | -24.5059 |
| Bottom | 1.382 | 201] 1.5 [DL + LL] | 3924.2795 | -53.7982 | 31.7793 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3881.8025 | -24.5059 | 17.4908 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3924.2795 | 31.7793 | 17.4908 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.402 | 201] 1.5 [DL + LL] | 4145.1105 | 54.0655 | -15.1791 |
| Bottom | 1.415 | 201] 1.5 [DL + LL] | 4187.5875 | -51.8024 | 65.1788 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4145.1105 | -15.1791 | 25.2638 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4187.5875 | 65.1788 | 25.2638 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.485 | 201] 1.5 [DL + LL] | 4404.9599 | 54.4487 | 23.2152 |
| Bottom | 1.562 | 201] 1.5 [DL + LL] | 4447.4369 | -58.4347 | -264.6097 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4404.9599 | 23.2152 | -91.8011 | 144.3262 | 352.0138 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4447.4369 | -264.6097 | -91.8011 | 144.3262 | 352.0138 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.469 | 201] 1.5 [DL + LL] | 4684.898 | 105.7677 | 783.1852 |
| Bottom | 1.264 | 201] 1.5 [DL + LL] | 4745.1594 | -94.7865 | 75.1689 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4684.898 | 783.1852 | -225.5921 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4745.1594 | 75.1689 | -225.5921 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.3 | 201] 1.5 [DL + LL] | 4974.3557 | 94.5859 | 26.8349 |
| Bottom | 1.307 | 201] 1.5 [DL + LL] | 5034.6171 | -93.5817 | -15.7906 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4974.3557 | 26.8349 | -13.6894 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5034.6171 | -15.7906 | -13.6894 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.363 | 201] 1.5 [DL + LL] | 5263.6373 | 91.9792 | -66.0788 |
| Bottom | 1.363 | 201] 1.5 [DL + LL] | 5323.8987 | -90.8025 | 26.8535 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5263.6373 | -66.0788 | 29.2085 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5323.8987 | 26.8535 | 29.2085 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.406 | 201] 1.5 [DL + LL] | 5551.4983 | 89.345 | -26.2086 |
| Bottom | 1.417 | 201] 1.5 [DL + LL] | 5611.7597 | -87.8236 | 36.6142 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5551.4983 | -26.2086 | 19.6176 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5611.7597 | 36.6142 | 19.6176 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.456 | 201] 1.5 [DL + LL] | 5837.3379 | 87.1298 | -17.3925 |
| Bottom | 1.469 | 201] 1.5 [DL + LL] | 5897.5993 | -85.3113 | 34.3418 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5837.3379 | -17.3925 | 16.138 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5897.5993 | 34.3418 | 16.138 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.518 | 201] 1.5 [DL + LL] | 6121.0978 | 84.3672 | -20.6123 |
| Bottom | 1.529 | 201] 1.5 [DL + LL] | 6181.3592 | -82.3917 | 32.4918 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6121.0978 | -20.6123 | 16.6119 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6181.3592 | 32.4918 | 16.6119 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.581 | 201] 1.5 [DL + LL] | 6402.7402 | 81.6089 | -23.8222 |
| Bottom | 1.593 | 201] 1.5 [DL + LL] | 6463.0016 | -79.7608 | 33.9047 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6402.7402 | -23.8222 | 18.1093 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6463.0016 | 33.9047 | 18.1093 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.643 | 201] 1.5 [DL + LL] | 6682.2507 | 77.9363 | -24.078 |
| Bottom | 1.653 | 201] 1.5 [DL + LL] | 6742.5121 | -73.8093 | 26.312 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6682.2507 | -24.078 | 15.8068 | 307.5112 | 602.154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6742.5121 | 26.312 | 15.8068 | 307.5112 | 602.154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.709 | 201] 1.5 [DL + LL] | 6959.6623 | 79.1927 | -33.6033 |
| Bottom | 1.731 | 201] 1.5 [DL + LL] | 7021.8367 | -88.9674 | -71.0912 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6959.6623 | -33.6033 | -11.8589 | 293.5889 | 588.2316 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7021.8367 | -71.0912 | -11.8589 | 293.5889 | 588.2316 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.104 | 201] 1.5 [DL + LL] | 7454.4468 | 187.0095 | 185.873 |
| Bottom | 2.116 | 201] 1.5 [DL + LL] | 7534.7953 | -189.3717 | -147.0316 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7454.4468 | 185.873 | -79.4213 | 216.8989 | 511.5417 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7534.7953 | -147.0316 | -79.4213 | 216.8989 | 511.5417 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.361 | 201] 1.5 [DL + LL] | 7967.3829 | 237.2051 | 128.8917 |
| Bottom | 2.359 | 201] 1.5 [DL + LL] | 8044.288 | -239.2764 | -55.3242 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7967.3829 | 128.8917 | -45.8479 | 226.6049 | 521.2477 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8044.288 | -55.3242 | -45.8479 | 226.6049 | 521.2477 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.976 | 201] 1.5 [DL + LL] | 2415.6438 | 155.3887 | -915.8523 |
| Bottom | 1.283 | 201] 1.5 [DL + LL] | 2472.3271 | -141.0603 | 253.1348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2415.6438 | -915.8523 | 370.7319 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2472.3271 | 253.1348 | 370.7319 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.127 | 201] 1.5 [DL + LL] | 2694.2701 | 124.9981 | -116.6212 |
| Bottom | 1.18 | 201] 1.5 [DL + LL] | 2750.9533 | -125.9169 | 195.2966 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2694.2701 | -116.6212 | 98.4891 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2750.9533 | 195.2966 | 98.4891 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.126 | 201] 1.5 [DL + LL] | 2972.7014 | 125.2992 | -163.953 |
| Bottom | 1.134 | 201] 1.5 [DL + LL] | 3029.3847 | -123.191 | 187.2071 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2972.7014 | -163.953 | 110.9745 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3029.3847 | 187.2071 | 110.9745 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.141 | 201] 1.5 [DL + LL] | 3251.4741 | 119.6834 | -167.1804 |
| Bottom | 1.149 | 201] 1.5 [DL + LL] | 3308.1573 | -118.0233 | 183.8251 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3251.4741 | -167.1804 | 110.9216 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3308.1573 | 183.8251 | 110.9216 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.201 | 201] 1.5 [DL + LL] | 3531.446 | 114.5631 | -165.1582 |
| Bottom | 1.21 | 201] 1.5 [DL + LL] | 3588.1292 | -112.7274 | 180.1379 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3531.446 | -165.1582 | 109.1057 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3588.1292 | 180.1379 | 109.1057 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.237 | 201] 1.5 [DL + LL] | 3813.4144 | 108.9513 | -162.8763 |
| Bottom | 1.245 | 201] 1.5 [DL + LL] | 3870.0977 | -106.9949 | 176.2801 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3813.4144 | -162.8763 | 107.1555 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3870.0977 | 176.2801 | 107.1555 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.243 | 201] 1.5 [DL + LL] | 4098.1217 | 102.9573 | -160.1726 |
| Bottom | 1.25 | 201] 1.5 [DL + LL] | 4154.8049 | -100.8589 | 172.3028 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4098.1217 | -160.1726 | 105.0354 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4154.8049 | 172.3028 | 105.0354 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.276 | 201] 1.5 [DL + LL] | 4386.2711 | 96.5226 | -156.9777 |
| Bottom | 1.283 | 201] 1.5 [DL + LL] | 4442.9543 | -94.2683 | 168.2207 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4386.2711 | -156.9777 | 102.7283 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4442.9543 | 168.2207 | 102.7283 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.322 | 201] 1.5 [DL + LL] | 4678.5304 | 89.6493 | -153.2415 |
| Bottom | 1.33 | 201] 1.5 [DL + LL] | 4735.2137 | -87.2129 | 164.2545 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4678.5304 | -153.2415 | 100.2893 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4735.2137 | 164.2545 | 100.2893 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.369 | 201] 1.5 [DL + LL] | 4975.5455 | 82.3263 | -148.6919 |
| Bottom | 1.377 | 201] 1.5 [DL + LL] | 5032.2288 | -79.7834 | 159.9354 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4975.5455 | -148.6919 | 97.4855 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5032.2288 | 159.9354 | 97.4855 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.415 | 201] 1.5 [DL + LL] | 5278.0158 | 74.1594 | -143.6267 |
| Bottom | 1.413 | 201] 1.5 [DL + LL] | 5334.6991 | -71.6021 | 108.8733 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5278.0158 | -143.6267 | 79.6429 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5334.6991 | 108.8733 | 79.6429 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.47 | 201] 1.5 [DL + LL] | 5585.4695 | 64.8284 | -188.209 |
| Bottom | 1.511 | 201] 1.5 [DL + LL] | 5642.1527 | -60.5402 | 487.87 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5585.4695 | -188.209 | 214.2143 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5642.1527 | 487.87 | 214.2143 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.349 | 201] 1.5 [DL + LL] | 5939.231 | 67.2032 | -1521.0416 |
| Bottom | 1.165 | 201] 1.5 [DL + LL] | 6017.1705 | -63.1784 | 211.4762 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5939.231 | -1521.0416 | 549.8533 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6017.1705 | 211.4762 | 549.8533 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.201 | 201] 1.5 [DL + LL] | 6294.0721 | 55.6925 | -163.9578 |
| Bottom | 1.213 | 201] 1.5 [DL + LL] | 6372.0116 | -55.1741 | 221.321 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6294.0721 | -163.9578 | 121.8077 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6372.0116 | 221.321 | 121.8077 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.265 | 201] 1.5 [DL + LL] | 6649.4468 | 53.0358 | -135.9164 |
| Bottom | 1.277 | 201] 1.5 [DL + LL] | 6727.3862 | -51.1113 | 188.2115 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6649.4468 | -135.9164 | 102.4889 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6727.3862 | 188.2115 | 102.4889 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.327 | 201] 1.5 [DL + LL] | 7005.9833 | 47.789 | -152.4555 |
| Bottom | 1.339 | 201] 1.5 [DL + LL] | 7083.9228 | -45.9549 | 177.9344 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7005.9833 | -152.4555 | 104.5202 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7083.9228 | 177.9344 | 104.5202 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.389 | 201] 1.5 [DL + LL] | 7364.0465 | 42.2063 | -145.9302 |
| Bottom | 1.401 | 201] 1.5 [DL + LL] | 7441.986 | -40.2503 | 169.7559 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7364.0465 | -145.9302 | 99.887 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7441.986 | 169.7559 | 99.887 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.451 | 201] 1.5 [DL + LL] | 7724.1559 | 36.2223 | -136.2227 |
| Bottom | 1.463 | 201] 1.5 [DL + LL] | 7802.0954 | -34.1307 | 160.4538 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7724.1559 | -136.2227 | 93.8932 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7802.0954 | 160.4538 | 93.8932 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.513 | 201] 1.5 [DL + LL] | 8086.8024 | 29.7411 | -126.4762 |
| Bottom | 1.525 | 201] 1.5 [DL + LL] | 8164.7419 | -27.4466 | 149.3419 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8086.8024 | -126.4762 | 87.3176 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8164.7419 | 149.3419 | 87.3176 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.575 | 201] 1.5 [DL + LL] | 8452.2503 | 22.8727 | -117.2142 |
| Bottom | 1.587 | 201] 1.5 [DL + LL] | 8530.1897 | -20.9545 | 138.7863 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8452.2503 | -117.2142 | 81.0743 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8530.1897 | 138.7863 | 81.0743 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.637 | 201] 1.5 [DL + LL] | 8821.4167 | 14.2397 | -107.9426 |
| Bottom | 1.648 | 201] 1.5 [DL + LL] | 8901.8304 | -10.4119 | 130.4034 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8821.4167 | -107.9426 | 73.1913 | 616.6286 | 997.7068 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8901.8304 | 130.4034 | 73.1913 | 616.6286 | 997.7068 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.077 | 201] 1.5 [DL + LL] | 9189.9254 | 271.8332 | -84.3148 |
| Bottom | 2.121 | 201] 1.5 [DL + LL] | 9293.8447 | -274.8884 | 188.1773 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9189.9254 | -84.3148 | 64.8711 | 380.16 | 761.2383 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9293.8447 | 188.1773 | 64.8711 | 380.16 | 761.2383 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.116 | 201] 1.5 [DL + LL] | 9640.0726 | 260.3692 | -127.8429 |
| Bottom | 2.125 | 201] 1.5 [DL + LL] | 9739.5382 | -263.0483 | 17.554 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9640.0726 | -127.8429 | 36.2526 | 406.0088 | 787.0871 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9739.5382 | 17.554 | 36.2526 | 406.0088 | 787.0871 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.844 | 201] 1.5 [DL + LL] | 2116.3683 | -145.149 | -821.4185 |
| Bottom | 1.193 | 201] 1.5 [DL + LL] | 2173.0516 | 132.5311 | 232.6575 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2116.3683 | -821.4185 | 334.3382 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2173.0516 | 232.6575 | 334.3382 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.044 | 201] 1.5 [DL + LL] | 2387.3398 | -117.2624 | -125.5452 |
| Bottom | 1.091 | 201] 1.5 [DL + LL] | 2444.023 | 118.7008 | 188.1236 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2387.3398 | -125.5452 | 99.149 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2444.023 | 188.1236 | 99.149 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.044 | 201] 1.5 [DL + LL] | 2659.7492 | -118.4427 | -160.1314 |
| Bottom | 1.054 | 201] 1.5 [DL + LL] | 2716.4324 | 116.8647 | 180.3956 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2659.7492 | -160.1314 | 107.6887 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2716.4324 | 180.3956 | 107.6887 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.063 | 201] 1.5 [DL + LL] | 2933.9573 | -113.7194 | -162.4799 |
| Bottom | 1.072 | 201] 1.5 [DL + LL] | 2990.6406 | 112.5767 | 177.088 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2933.9573 | -162.4799 | 107.3758 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2990.6406 | 177.088 | 107.3758 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.115 | 201] 1.5 [DL + LL] | 3210.3982 | -109.463 | -159.8526 |
| Bottom | 1.126 | 201] 1.5 [DL + LL] | 3267.0815 | 108.1309 | 173.3993 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3210.3982 | -159.8526 | 105.3637 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3267.0815 | 173.3993 | 105.3637 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.153 | 201] 1.5 [DL + LL] | 3489.5284 | -104.6754 | -157.0734 |
| Bottom | 1.163 | 201] 1.5 [DL + LL] | 3546.2117 | 103.2177 | 169.3977 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3489.5284 | -157.0734 | 103.207 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3546.2117 | 169.3977 | 103.207 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.163 | 201] 1.5 [DL + LL] | 3771.7908 | -99.4589 | -154.0449 |
| Bottom | 1.172 | 201] 1.5 [DL + LL] | 3828.474 | 97.862 | 165.1507 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3771.7908 | -154.0449 | 100.8952 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3828.474 | 165.1507 | 100.8952 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.198 | 201] 1.5 [DL + LL] | 4057.624 | -93.7523 | -150.6863 |
| Bottom | 1.206 | 201] 1.5 [DL + LL] | 4114.3072 | 92.0101 | 160.6706 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4057.624 | -150.6863 | 98.4064 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4114.3072 | 160.6706 | 98.4064 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.24 | 201] 1.5 [DL + LL] | 4347.4595 | -87.5515 | -146.9574 |
| Bottom | 1.25 | 201] 1.5 [DL + LL] | 4404.1428 | 85.6433 | 156.3175 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4347.4595 | -146.9574 | 95.8422 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4404.1428 | 156.3175 | 95.8422 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.288 | 201] 1.5 [DL + LL] | 4641.7342 | -80.845 | -142.4503 |
| Bottom | 1.297 | 201] 1.5 [DL + LL] | 4698.4174 | 78.8545 | 151.472 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4641.7342 | -142.4503 | 92.8778 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4698.4174 | 151.472 | 92.8778 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.335 | 201] 1.5 [DL + LL] | 4940.9316 | -73.241 | -137.5978 |
| Bottom | 1.334 | 201] 1.5 [DL + LL] | 4997.6149 | 71.2726 | 100.954 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4940.9316 | -137.5978 | 75.2691 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4997.6149 | 100.954 | 75.2691 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.39 | 201] 1.5 [DL + LL] | 5244.4137 | -64.4671 | -181.0692 |
| Bottom | 1.43 | 201] 1.5 [DL + LL] | 5301.097 | 60.9029 | 457.1699 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5244.4137 | -181.0692 | 202.2231 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5301.097 | 457.1699 | 202.2231 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.28 | 201] 1.5 [DL + LL] | 5593.6891 | -66.9196 | -1433.5389 |
| Bottom | 1.106 | 201] 1.5 [DL + LL] | 5671.6286 | 63.5298 | 203.8808 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5593.6891 | -1433.5389 | 519.6358 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5671.6286 | 203.8808 | 519.6358 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.137 | 201] 1.5 [DL + LL] | 5944.8259 | -55.9028 | -149.5841 |
| Bottom | 1.153 | 201] 1.5 [DL + LL] | 6022.7654 | 55.7259 | 213.2026 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5944.8259 | -149.5841 | 114.6852 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6022.7654 | 213.2026 | 114.6852 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.201 | 201] 1.5 [DL + LL] | 6296.1311 | -53.4563 | -122.298 |
| Bottom | 1.212 | 201] 1.5 [DL + LL] | 6374.0706 | 51.8806 | 178.6412 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6296.1311 | -122.298 | 95.1457 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6374.0706 | 178.6412 | 95.1457 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.261 | 201] 1.5 [DL + LL] | 6648.2089 | -48.2939 | -140.5766 |
| Bottom | 1.274 | 201] 1.5 [DL + LL] | 6726.1484 | 46.8533 | 168.2688 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6648.2089 | -140.5766 | 97.6989 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6726.1484 | 168.2688 | 97.6989 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.322 | 201] 1.5 [DL + LL] | 7001.2965 | -42.859 | -134.4002 |
| Bottom | 1.335 | 201] 1.5 [DL + LL] | 7079.236 | 41.2963 | 160.1308 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7001.2965 | -134.4002 | 93.1888 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7079.236 | 160.1308 | 93.1888 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.384 | 201] 1.5 [DL + LL] | 7355.818 | -37.0029 | -124.8868 |
| Bottom | 1.396 | 201] 1.5 [DL + LL] | 7433.7575 | 35.307 | 150.7682 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7355.818 | -124.8868 | 87.2366 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7433.7575 | 150.7682 | 87.2366 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.445 | 201] 1.5 [DL + LL] | 7712.1737 | -30.6549 | -115.4219 |
| Bottom | 1.457 | 201] 1.5 [DL + LL] | 7790.1132 | 28.7947 | 139.1947 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7712.1737 | -115.4219 | 80.6022 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7790.1132 | 139.1947 | 80.6022 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.506 | 201] 1.5 [DL + LL] | 8070.553 | -23.8296 | -106.8499 |
| Bottom | 1.518 | 201] 1.5 [DL + LL] | 8148.4925 | 22.3785 | 127.6333 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8070.553 | -106.8499 | 74.2547 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8148.4925 | 127.6333 | 74.2547 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.566 | 201] 1.5 [DL + LL] | 8431.9388 | -15.3678 | -98.989 |
| Bottom | 1.578 | 201] 1.5 [DL + LL] | 8512.3525 | 12.224 | 115.3641 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8431.9388 | -98.989 | 65.8099 | 616.6286 | 997.7068 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8512.3525 | 115.3641 | 65.8099 | 616.6286 | 997.7068 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.977 | 201] 1.5 [DL + LL] | 8793.1173 | -256.6584 | -79.6422 |
| Bottom | 2.03 | 201] 1.5 [DL + LL] | 8897.0366 | 259.7137 | 227.4941 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8793.1173 | -79.6422 | 73.1328 | 380.16 | 761.2383 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8897.0366 | 227.4941 | 73.1328 | 380.16 | 761.2383 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.047 | 201] 1.5 [DL + LL] | 9296.775 | -249.789 | -171.4395 |
| Bottom | 2.048 | 201] 1.5 [DL + LL] | 9396.2406 | 252.468 | 25.5252 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9296.775 | -171.4395 | 49.1025 | 406.0088 | 787.0871 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9396.2406 | 25.5252 | 49.1025 | 406.0088 | 787.0871 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.872 | 201] 1.5 [DL + LL] | 2121.5349 | -232.0726 | 280.235 |
| Bottom | 0.661 | 201] 1.5 [DL + LL] | 2197.3487 | 197.4154 | -17.5285 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2121.5349 | 280.235 | -94.4953 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2197.3487 | -17.5285 | -94.4953 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.628 | 201] 1.5 [DL + LL] | 2526.3479 | -162.5459 | 87.7383 |
| Bottom | 0.647 | 201] 1.5 [DL + LL] | 2602.1618 | 170.8297 | -63.254 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2526.3479 | 87.7383 | -47.773 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2602.1618 | -63.254 | -47.773 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.678 | 201] 1.5 [DL + LL] | 2927.5661 | -172.3474 | 40.0617 |
| Bottom | 0.685 | 201] 1.5 [DL + LL] | 3003.3799 | 170.046 | -55.9084 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2927.5661 | 40.0617 | -30.2919 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3003.3799 | -55.9084 | -30.2919 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.715 | 201] 1.5 [DL + LL] | 3324.7751 | -163.9631 | 43.7476 |
| Bottom | 0.725 | 201] 1.5 [DL + LL] | 3400.5889 | 163.622 | -50.696 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3324.7751 | 43.7476 | -29.8033 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3400.5889 | -50.696 | -29.8033 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.76 | 201] 1.5 [DL + LL] | 3718.084 | -159.5278 | 46.1235 |
| Bottom | 0.768 | 201] 1.5 [DL + LL] | 3793.8978 | 158.5032 | -49.3545 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3718.084 | 46.1235 | -30.1202 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3793.8978 | -49.3545 | -30.1202 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.802 | 201] 1.5 [DL + LL] | 4107.578 | -154.2778 | 45.0365 |
| Bottom | 0.811 | 201] 1.5 [DL + LL] | 4183.3919 | 153.147 | -48.5029 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4107.578 | 45.0365 | -29.4934 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4183.3919 | -48.5029 | -29.4934 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.838 | 201] 1.5 [DL + LL] | 4493.2301 | -149.1397 | 43.7468 |
| Bottom | 0.848 | 201] 1.5 [DL + LL] | 4569.044 | 147.7962 | -47.5974 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4493.2301 | 43.7468 | -28.7879 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4569.044 | -47.5974 | -28.7879 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.887 | 201] 1.5 [DL + LL] | 4874.9927 | -143.8791 | 42.7582 |
| Bottom | 0.897 | 201] 1.5 [DL + LL] | 4950.8066 | 142.3986 | -46.7938 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4874.9927 | 42.7582 | -28.2127 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4950.8066 | -46.7938 | -28.2127 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.935 | 201] 1.5 [DL + LL] | 5252.7886 | -138.3904 | 41.8953 |
| Bottom | 0.945 | 201] 1.5 [DL + LL] | 5328.6024 | 136.6381 | -48.7602 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5252.7886 | 41.8953 | -28.5611 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5328.6024 | -48.7602 | -28.5611 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.982 | 201] 1.5 [DL + LL] | 5626.5023 | -132.9828 | 38.3854 |
| Bottom | 0.995 | 201] 1.5 [DL + LL] | 5702.3161 | 131.0249 | -62.9254 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5626.5023 | 38.3854 | -31.966 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5702.3161 | -62.9254 | -31.966 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.024 | 201] 1.5 [DL + LL] | 5995.9947 | -127.1165 | 22.4177 |
| Bottom | 1.042 | 201] 1.5 [DL + LL] | 6071.8086 | 125.5778 | -61.608 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5995.9947 | 22.4177 | -26.5715 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6071.8086 | -61.608 | -26.5715 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.074 | 201] 1.5 [DL + LL] | 6359.4642 | -118.1296 | 20.7246 |
| Bottom | 1.109 | 201] 1.5 [DL + LL] | 6435.278 | 114.1277 | 343.9257 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6359.4642 | 20.7246 | 102.9431 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6435.278 | 343.9257 | 102.9431 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.015 | 201] 1.5 [DL + LL] | 6730.1488 | -138.9974 | -866.7619 |
| Bottom | 0.959 | 201] 1.5 [DL + LL] | 6824.6209 | 130.4937 | -88.2503 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6730.1488 | -866.7619 | 247.6902 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6824.6209 | -88.2503 | 247.6902 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.985 | 201] 1.5 [DL + LL] | 7107.7893 | -119.9014 | -45.7468 |
| Bottom | 0.999 | 201] 1.5 [DL + LL] | 7202.2614 | 120.5037 | 11.6756 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7107.7893 | -45.7468 | 18.2746 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7202.2614 | 11.6756 | 18.2746 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.035 | 201] 1.5 [DL + LL] | 7484.3171 | -120.8735 | 55.8392 |
| Bottom | 1.048 | 201] 1.5 [DL + LL] | 7578.7892 | 118.4635 | -15.5217 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7484.3171 | 55.8392 | -22.5382 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7578.7892 | -15.5217 | -22.5382 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.083 | 201] 1.5 [DL + LL] | 7859.3231 | -114.4632 | 31.1168 |
| Bottom | 1.095 | 201] 1.5 [DL + LL] | 7953.7952 | 112.8931 | -28.1906 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7859.3231 | 31.1168 | -18.6719 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7953.7952 | -28.1906 | -18.6719 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.132 | 201] 1.5 [DL + LL] | 8232.237 | -109.9953 | 20.4757 |
| Bottom | 1.143 | 201] 1.5 [DL + LL] | 8326.7091 | 107.9159 | -31.4419 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8232.237 | 20.4757 | -16.3331 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8326.7091 | -31.4419 | -16.3331 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.179 | 201] 1.5 [DL + LL] | 8602.8815 | -104.7433 | 19.2224 |
| Bottom | 1.19 | 201] 1.5 [DL + LL] | 8697.3536 | 102.4536 | -34.366 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8602.8815 | 19.2224 | -16.8864 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8697.3536 | -34.366 | -16.8864 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.226 | 201] 1.5 [DL + LL] | 8971.0611 | -99.4614 | 18.4212 |
| Bottom | 1.237 | 201] 1.5 [DL + LL] | 9065.5332 | 97.1532 | -33.1676 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8971.0611 | 18.4212 | -16.2835 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9065.5332 | -33.1676 | -16.2835 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.272 | 201] 1.5 [DL + LL] | 9336.5941 | -93.3409 | 21.9176 |
| Bottom | 1.283 | 201] 1.5 [DL + LL] | 9431.0662 | 89.4924 | -7.431 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9336.5941 | 21.9176 | -9.2363 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9431.0662 | -7.431 | -9.2363 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.318 | 201] 1.5 [DL + LL] | 9699.5114 | -89.8562 | 50.7616 |
| Bottom | 1.334 | 201] 1.5 [DL + LL] | 9796.9826 | 99.6188 | 43.0802 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9699.5114 | 50.7616 | -2.1448 | 604.8 | 1066.713 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9796.9826 | 43.0802 | -2.1448 | 604.8 | 1066.713 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.353 | 201] 1.5 [DL + LL] | 10178.8644 | -80.405 | -141.5509 |
| Bottom | 1.371 | 201] 1.5 [DL + LL] | 10304.8272 | 77.6494 | 68.6301 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10178.8644 | -141.5509 | 50.132 | 405.8182 | 867.7312 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10304.8272 | 68.6301 | 50.132 | 405.8182 | 867.7312 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 201] 1.5 [DL + LL] | 10659.2852 | -49.5743 | -65.7468 |
| Bottom | 1.415 | 201] 1.5 [DL + LL] | 10779.8496 | 26.771 | 37.4646 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10659.2852 | -65.7468 | 25.6661 | 429.1485 | 891.0616 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10779.8496 | 37.4646 | 25.6661 | 429.1485 | 891.0616 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.77 | 201] 1.5 [DL + LL] | 2044.4111 | -209.2117 | -255.505 |
| Bottom | 0.596 | 201] 1.5 [DL + LL] | 2120.225 | 176.5034 | 1.6096 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2044.4111 | -255.505 | 81.8387 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2120.225 | 1.6096 | 81.8387 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.586 | 201] 1.5 [DL + LL] | 2435.354 | -147.7762 | -81.307 |
| Bottom | 0.6 | 201] 1.5 [DL + LL] | 2511.1679 | 154.8288 | 48.4802 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2435.354 | -81.307 | 41.3392 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2511.1679 | 48.4802 | 41.3392 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.636 | 201] 1.5 [DL + LL] | 2823.7571 | -157.0688 | -34.0368 |
| Bottom | 0.644 | 201] 1.5 [DL + LL] | 2899.571 | 155.0477 | 42.5445 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2823.7571 | -34.0368 | 24.4703 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2899.571 | 42.5445 | 24.4703 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.677 | 201] 1.5 [DL + LL] | 3209.7657 | -150.5373 | -38.3254 |
| Bottom | 0.686 | 201] 1.5 [DL + LL] | 3285.5795 | 150.2643 | 37.8974 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3209.7657 | -38.3254 | 24.385 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3285.5795 | 37.8974 | 24.385 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.722 | 201] 1.5 [DL + LL] | 3593.2068 | -147.2714 | -41.8424 |
| Bottom | 0.73 | 201] 1.5 [DL + LL] | 3669.0207 | 146.4403 | 37.0184 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3593.2068 | -41.8424 | 25.2396 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3669.0207 | 37.0184 | 25.2396 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.767 | 201] 1.5 [DL + LL] | 3974.0477 | -143.2039 | -41.8788 |
| Bottom | 0.776 | 201] 1.5 [DL + LL] | 4049.8616 | 142.2753 | 36.5303 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3974.0477 | -41.8788 | 25.1089 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4049.8616 | 36.5303 | 25.1089 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.805 | 201] 1.5 [DL + LL] | 4352.1312 | -139.1645 | -41.6772 |
| Bottom | 0.814 | 201] 1.5 [DL + LL] | 4427.9451 | 138.0108 | 35.8821 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4352.1312 | -41.6772 | 24.8493 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4427.9451 | 35.8821 | 24.8493 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.855 | 201] 1.5 [DL + LL] | 4727.2868 | -134.9682 | -41.7585 |
| Bottom | 0.863 | 201] 1.5 [DL + LL] | 4803.1007 | 133.6296 | 35.247 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4727.2868 | -41.7585 | 24.6803 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4803.1007 | 35.247 | 24.6803 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.903 | 201] 1.5 [DL + LL] | 5099.3205 | -130.5337 | -41.9373 |
| Bottom | 0.911 | 201] 1.5 [DL + LL] | 5175.1344 | 128.8447 | 37.3209 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5099.3205 | -41.9373 | 25.4003 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5175.1344 | 37.3209 | 25.4003 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.951 | 201] 1.5 [DL + LL] | 5467.9801 | -126.2075 | -39.3983 |
| Bottom | 0.962 | 201] 1.5 [DL + LL] | 5543.7939 | 124.2292 | 51.3639 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5467.9801 | -39.3983 | 29.0739 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5543.7939 | 51.3639 | 29.0739 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.994 | 201] 1.5 [DL + LL] | 5833.052 | -121.372 | -24.5584 |
| Bottom | 1.009 | 201] 1.5 [DL + LL] | 5908.8659 | 119.6188 | 48.6864 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5833.052 | -24.5584 | 23.5935 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5908.8659 | 48.6864 | 23.5935 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.045 | 201] 1.5 [DL + LL] | 6192.5856 | -113.8472 | -25.1009 |
| Bottom | 1.079 | 201] 1.5 [DL + LL] | 6268.3994 | 109.2445 | -347.5726 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6192.5856 | -25.1009 | -102.2719 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6268.3994 | -347.5726 | -102.2719 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.988 | 201] 1.5 [DL + LL] | 6560.5034 | -135.3975 | 835.6965 |
| Bottom | 0.934 | 201] 1.5 [DL + LL] | 6654.9755 | 127.3279 | 74.2617 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6560.5034 | 835.6965 | -241.858 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6654.9755 | 74.2617 | -241.858 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.961 | 201] 1.5 [DL + LL] | 6936.2414 | -115.505 | 37.9245 |
| Bottom | 0.975 | 201] 1.5 [DL + LL] | 7030.7135 | 116.8026 | -24.1056 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6936.2414 | 37.9245 | -19.3579 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7030.7135 | -24.1056 | -19.3579 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.011 | 201] 1.5 [DL + LL] | 7311.738 | -117.195 | -63.2307 |
| Bottom | 1.025 | 201] 1.5 [DL + LL] | 7406.2101 | 115.1445 | 2.3961 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7311.738 | -63.2307 | 21.0818 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7406.2101 | 2.3961 | 21.0818 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.059 | 201] 1.5 [DL + LL] | 7685.9567 | -111.3163 | -39.9067 |
| Bottom | 1.072 | 201] 1.5 [DL + LL] | 7780.4288 | 110.0267 | 15.4127 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7685.9567 | -39.9067 | 17.7475 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7780.4288 | 15.4127 | 17.7475 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.107 | 201] 1.5 [DL + LL] | 8058.465 | -107.2941 | -29.7095 |
| Bottom | 1.119 | 201] 1.5 [DL + LL] | 8152.9371 | 105.4796 | 19.1277 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8058.465 | -29.7095 | 15.6689 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8152.9371 | 19.1277 | 15.6689 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.155 | 201] 1.5 [DL + LL] | 8429.0476 | -102.4958 | -28.7547 |
| Bottom | 1.166 | 201] 1.5 [DL + LL] | 8523.5197 | 100.3785 | 22.6592 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8429.0476 | -28.7547 | 16.4778 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8523.5197 | 22.6592 | 16.4778 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.202 | 201] 1.5 [DL + LL] | 8797.4677 | -97.8035 | -28.0659 |
| Bottom | 1.214 | 201] 1.5 [DL + LL] | 8891.9398 | 95.8958 | 22.1207 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8797.4677 | -28.0659 | 16.085 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8891.9398 | 22.1207 | 16.085 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.248 | 201] 1.5 [DL + LL] | 9163.6079 | -91.5423 | -31.6701 |
| Bottom | 1.259 | 201] 1.5 [DL + LL] | 9258.0801 | 86.4501 | -8.3962 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9163.6079 | -31.6701 | 7.5141 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9258.0801 | -8.3962 | 7.5141 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.295 | 201] 1.5 [DL + LL] | 9526.9218 | -91.9832 | -65.647 |
| Bottom | 1.313 | 201] 1.5 [DL + LL] | 9624.393 | 107.7204 | -91.9709 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9526.9218 | -65.647 | -8.1937 | 604.8 | 1066.713 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9624.393 | -91.9709 | -8.1937 | 604.8 | 1066.713 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.339 | 201] 1.5 [DL + LL] | 10060.0155 | -85.7266 | 158.8545 |
| Bottom | 1.355 | 201] 1.5 [DL + LL] | 10185.9783 | 78.3878 | -78.2715 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10060.0155 | 158.8545 | -56.4954 | 405.8182 | 867.7312 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10185.9783 | -78.2715 | -56.4954 | 405.8182 | 867.7312 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.39 | 201] 1.5 [DL + LL] | 10535.3008 | -46.1911 | 51.3657 |
| Bottom | 1.398 | 201] 1.5 [DL + LL] | 10655.8652 | 24.6059 | -38.5838 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10535.3008 | 51.3657 | -22.3514 | 429.1485 | 891.0616 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10655.8652 | -38.5838 | -22.3514 | 429.1485 | 891.0616 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.651 | 201] 1.5 [DL + LL] | 2028.1235 | 166.5866 | 268.9483 |
| Bottom | 0.51 | 201] 1.5 [DL + LL] | 2103.9374 | -135.0737 | -22.1925 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2028.1235 | 268.9483 | -92.3982 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2103.9374 | -22.1925 | -92.3982 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.52 | 201] 1.5 [DL + LL] | 2437.542 | 111.7861 | 90.9095 |
| Bottom | 0.533 | 201] 1.5 [DL + LL] | 2513.3558 | -116.3239 | -65.2554 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2437.542 | 90.9095 | -49.4307 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2513.3558 | -65.2554 | -49.4307 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.584 | 201] 1.5 [DL + LL] | 2842.0814 | 123.1063 | 44.4058 |
| Bottom | 0.59 | 201] 1.5 [DL + LL] | 2917.8953 | -118.7385 | -58.5023 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2842.0814 | 44.4058 | -32.5085 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2917.8953 | -58.5023 | -32.5085 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.631 | 201] 1.5 [DL + LL] | 3242.5619 | 118.9656 | 47.1411 |
| Bottom | 0.638 | 201] 1.5 [DL + LL] | 3318.3757 | -116.4313 | -53.3104 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3242.5619 | 47.1411 | -31.7234 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3318.3757 | -53.3104 | -31.7234 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.686 | 201] 1.5 [DL + LL] | 3638.8076 | 117.7457 | 48.8751 |
| Bottom | 0.694 | 201] 1.5 [DL + LL] | 3714.6214 | -114.8796 | -51.7405 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3638.8076 | 48.8751 | -31.7638 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3714.6214 | -51.7405 | -31.7638 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.742 | 201] 1.5 [DL + LL] | 4030.9744 | 115.6231 | 47.4861 |
| Bottom | 0.75 | 201] 1.5 [DL + LL] | 4106.7882 | -112.8463 | -50.6448 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4030.9744 | 47.4861 | -30.9636 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4106.7882 | -50.6448 | -30.9636 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.784 | 201] 1.5 [DL + LL] | 4419.0561 | 113.4193 | 45.9544 |
| Bottom | 0.793 | 201] 1.5 [DL + LL] | 4494.87 | -110.5738 | -49.4988 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4419.0561 | 45.9544 | -30.1047 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4494.87 | -49.4988 | -30.1047 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.837 | 201] 1.5 [DL + LL] | 4803.0239 | 110.9897 | 44.7584 |
| Bottom | 0.845 | 201] 1.5 [DL + LL] | 4878.8378 | -108.071 | -48.4313 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4803.0239 | 44.7584 | -29.3796 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4878.8378 | -48.4313 | -29.3796 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.889 | 201] 1.5 [DL + LL] | 5182.7999 | 108.2896 | 43.727 |
| Bottom | 0.898 | 201] 1.5 [DL + LL] | 5258.6137 | -105.1119 | -50.2131 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5182.7999 | 43.727 | -29.6152 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5258.6137 | -50.2131 | -29.6152 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.94 | 201] 1.5 [DL + LL] | 5558.2576 | 105.6265 | 39.9704 |
| Bottom | 0.952 | 201] 1.5 [DL + LL] | 5634.0714 | -102.2384 | -64.1119 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5558.2576 | 39.9704 | -32.8563 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5634.0714 | -64.1119 | -32.8563 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.998 | 201] 1.5 [DL + LL] | 5929.2347 | 102.4674 | 23.8312 |
| Bottom | 1.007 | 201] 1.5 [DL + LL] | 6005.0486 | -99.3282 | -61.6452 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5929.2347 | 23.8312 | -27.0396 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6005.0486 | -61.6452 | -27.0396 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.054 | 201] 1.5 [DL + LL] | 6293.949 | 96.5774 | 22.8629 |
| Bottom | 1.077 | 201] 1.5 [DL + LL] | 6369.7629 | -91.3311 | 340.9105 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6293.949 | 22.8629 | 101.3002 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6369.7629 | 340.9105 | 101.3002 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.976 | 201] 1.5 [DL + LL] | 6669.0427 | 114.3496 | -852.3252 |
| Bottom | 0.933 | 201] 1.5 [DL + LL] | 6763.5148 | -105.0231 | -93.8416 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6669.0427 | -852.3252 | 241.3318 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6763.5148 | -93.8416 | 241.3318 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.97 | 201] 1.5 [DL + LL] | 7054.1639 | 98.8068 | -45.5227 |
| Bottom | 0.984 | 201] 1.5 [DL + LL] | 7148.636 | -97.9461 | 7.6912 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7054.1639 | -45.5227 | 16.9408 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7148.636 | 7.6912 | 16.9408 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.022 | 201] 1.5 [DL + LL] | 7436.9497 | 101.7608 | 56.7736 |
| Bottom | 1.034 | 201] 1.5 [DL + LL] | 7531.4218 | -97.9409 | -17.6454 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7436.9497 | 56.7736 | -23.512 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7531.4218 | -17.6454 | -23.512 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.072 | 201] 1.5 [DL + LL] | 7817.3812 | 97.998 | 33.2809 |
| Bottom | 1.083 | 201] 1.5 [DL + LL] | 7911.8533 | -94.8294 | -30.123 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7817.3812 | 33.2809 | -19.9756 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7911.8533 | -30.123 | -19.9756 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.121 | 201] 1.5 [DL + LL] | 8194.9461 | 95.8588 | 22.2449 |
| Bottom | 1.132 | 201] 1.5 [DL + LL] | 8289.4182 | -92.1791 | -33.3075 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8194.9461 | 22.2449 | -17.4898 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8289.4182 | -33.3075 | -17.4898 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.17 | 201] 1.5 [DL + LL] | 8569.5627 | 92.9718 | 20.5283 |
| Bottom | 1.18 | 201] 1.5 [DL + LL] | 8664.0348 | -89.0532 | -36.022 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8569.5627 | 20.5283 | -17.8296 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8664.0348 | -36.022 | -17.8296 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.218 | 201] 1.5 [DL + LL] | 8941.102 | 90.0002 | 19.4399 |
| Bottom | 1.229 | 201] 1.5 [DL + LL] | 9035.5741 | -85.9933 | -33.9398 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8941.102 | 19.4399 | -16.8552 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9035.5741 | -33.9398 | -16.8552 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.265 | 201] 1.5 [DL + LL] | 9309.4214 | 86.2684 | 23.3568 |
| Bottom | 1.276 | 201] 1.5 [DL + LL] | 9403.8935 | -80.8537 | -6.124 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9309.4214 | 23.3568 | -9.2784 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9403.8935 | -6.124 | -9.2784 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.312 | 201] 1.5 [DL + LL] | 9674.6524 | 84.5874 | 53.9956 |
| Bottom | 1.328 | 201] 1.5 [DL + LL] | 9772.1237 | -90.6282 | 37.2199 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9674.6524 | 53.9956 | -4.937 | 604.8 | 1066.713 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9772.1237 | 37.2199 | -4.937 | 604.8 | 1066.713 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.348 | 201] 1.5 [DL + LL] | 10151.1572 | 75.9261 | -142.196 |
| Bottom | 1.366 | 201] 1.5 [DL + LL] | 10277.12 | -73.4659 | 70.5502 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10151.1572 | -142.196 | 50.7402 | 405.8182 | 867.7312 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10277.12 | 70.5502 | 50.7402 | 405.8182 | 867.7312 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.403 | 201] 1.5 [DL + LL] | 10631.6087 | 48.7738 | -63.9449 |
| Bottom | 1.41 | 201] 1.5 [DL + LL] | 10752.1731 | -24.3957 | 34.9128 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10631.6087 | -63.9449 | 24.5876 | 429.1485 | 891.0616 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10752.1731 | 34.9128 | 24.5876 | 429.1485 | 891.0616 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.634 | 201] 1.5 [DL + LL] | 2000.3264 | 162.1612 | -258.5733 |
| Bottom | 0.499 | 201] 1.5 [DL + LL] | 2076.1402 | -132.5963 | 11.9862 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2000.3264 | -258.5733 | 86.0929 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2076.1402 | 11.9862 | 86.0929 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.505 | 201] 1.5 [DL + LL] | 2395.1476 | 106.7426 | -86.4369 |
| Bottom | 0.52 | 201] 1.5 [DL + LL] | 2470.9614 | -112.5282 | 55.775 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2395.1476 | -86.4369 | 45.2755 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2470.9614 | 55.775 | 45.2755 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.57 | 201] 1.5 [DL + LL] | 2786.7284 | 119.0099 | -41.0904 |
| Bottom | 0.575 | 201] 1.5 [DL + LL] | 2862.5423 | -115.0839 | 49.5047 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2786.7284 | -41.0904 | 28.9112 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 2862.5423 | 49.5047 | 28.9112 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 201] 1.5 [DL + LL] | 3175.1728 | 114.9027 | -44.6713 |
| Bottom | 0.623 | 201] 1.5 [DL + LL] | 3250.9867 | -112.7975 | 44.4619 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3175.1728 | -44.6713 | 28.4751 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3250.9867 | 44.4619 | 28.4751 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.67 | 201] 1.5 [DL + LL] | 3560.4075 | 113.9346 | -47.5727 |
| Bottom | 0.678 | 201] 1.5 [DL + LL] | 3636.2213 | -111.4056 | 43.0399 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3560.4075 | -47.5727 | 28.9621 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3636.2213 | 43.0399 | 28.9621 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.724 | 201] 1.5 [DL + LL] | 3942.5647 | 112.0991 | -47.2727 |
| Bottom | 0.732 | 201] 1.5 [DL + LL] | 4018.3785 | -109.6287 | 42.1153 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 3942.5647 | -47.2727 | 28.5862 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4018.3785 | 42.1153 | 28.5862 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.767 | 201] 1.5 [DL + LL] | 4321.6596 | 110.2133 | -46.7646 |
| Bottom | 0.774 | 201] 1.5 [DL + LL] | 4397.4735 | -107.6873 | 41.157 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4321.6596 | -46.7646 | 28.1309 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4397.4735 | 41.157 | 28.1309 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.819 | 201] 1.5 [DL + LL] | 4697.6987 | 108.1182 | -46.5524 |
| Bottom | 0.826 | 201] 1.5 [DL + LL] | 4773.5126 | -105.5579 | 40.3184 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4697.6987 | -46.5524 | 27.8045 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 4773.5126 | 40.3184 | 27.8045 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.87 | 201] 1.5 [DL + LL] | 5070.6569 | 105.7879 | -46.4575 |
| Bottom | 0.877 | 201] 1.5 [DL + LL] | 5146.4707 | -103.0891 | 42.3886 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5070.6569 | -46.4575 | 28.437 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5146.4707 | 42.3886 | 28.437 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.921 | 201] 1.5 [DL + LL] | 5440.5032 | 103.3818 | -43.6157 |
| Bottom | 0.931 | 201] 1.5 [DL + LL] | 5516.3171 | -100.4441 | 56.4396 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5440.5032 | -43.6157 | 32.0185 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5516.3171 | 56.4396 | 32.0185 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.977 | 201] 1.5 [DL + LL] | 5807.0718 | 100.7989 | -28.4971 |
| Bottom | 0.987 | 201] 1.5 [DL + LL] | 5882.8856 | -98.3672 | 53.7508 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5807.0718 | -28.4971 | 26.4484 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 5882.8856 | 53.7508 | 26.4484 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.033 | 201] 1.5 [DL + LL] | 6169.1469 | 95.2995 | -29.2366 |
| Bottom | 1.058 | 201] 1.5 [DL + LL] | 6244.9608 | -91.6542 | -341.8808 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6169.1469 | -29.2366 | -99.1508 | 355.6555 | 726.3408 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6244.9608 | -341.8808 | -99.1508 | 355.6555 | 726.3408 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.955 | 201] 1.5 [DL + LL] | 6541.9248 | 110.9145 | 826.4614 |
| Bottom | 0.915 | 201] 1.5 [DL + LL] | 6636.3969 | -101.9067 | 80.6372 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6541.9248 | 826.4614 | -236.8991 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6636.3969 | 80.6372 | -236.8991 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.954 | 201] 1.5 [DL + LL] | 6925.2197 | 100.3864 | 33.202 |
| Bottom | 0.966 | 201] 1.5 [DL + LL] | 7019.6918 | -98.0553 | -19.3196 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 6925.2197 | 33.202 | -16.3369 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7019.6918 | -19.3196 | -16.3369 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.004 | 201] 1.5 [DL + LL] | 7305.9089 | 100.6398 | -67.804 |
| Bottom | 1.017 | 201] 1.5 [DL + LL] | 7400.381 | -96.9968 | 6.4234 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7305.9089 | -67.804 | 23.8152 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7400.381 | 6.4234 | 23.8152 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 201] 1.5 [DL + LL] | 7684.576 | 97.1354 | -44.6338 |
| Bottom | 1.065 | 201] 1.5 [DL + LL] | 7779.0481 | -93.7971 | 19.2382 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7684.576 | -44.6338 | 20.4646 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 7779.0481 | 19.2382 | 20.4646 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.103 | 201] 1.5 [DL + LL] | 8060.6703 | 94.7501 | -33.8816 |
| Bottom | 1.114 | 201] 1.5 [DL + LL] | 8155.1424 | -90.9684 | 22.8669 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8060.6703 | -33.8816 | 18.1815 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8155.1424 | 22.8669 | 18.1815 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.151 | 201] 1.5 [DL + LL] | 8434.1257 | 91.6775 | -32.3331 |
| Bottom | 1.162 | 201] 1.5 [DL + LL] | 8528.5978 | -87.689 | 25.9244 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8434.1257 | -32.3331 | 18.6512 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8528.5978 | 25.9244 | 18.6512 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.199 | 201] 1.5 [DL + LL] | 8804.8541 | 88.5117 | -31.5129 |
| Bottom | 1.21 | 201] 1.5 [DL + LL] | 8899.3262 | -84.4015 | 23.461 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8804.8541 | -31.5129 | 17.6041 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 8899.3262 | 23.461 | 17.6041 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.246 | 201] 1.5 [DL + LL] | 9172.6258 | 84.806 | -36.3414 |
| Bottom | 1.258 | 201] 1.5 [DL + LL] | 9267.0979 | -79.8007 | -6.8371 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9172.6258 | -36.3414 | 9.4844 | 644.8696 | 1106.7826 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9267.0979 | -6.8371 | 9.4844 | 644.8696 | 1106.7826 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.293 | 201] 1.5 [DL + LL] | 9538.2372 | 81.7402 | -70.4684 |
| Bottom | 1.308 | 201] 1.5 [DL + LL] | 9635.7084 | -86.4684 | -57.1663 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9538.2372 | -70.4684 | 4.0032 | 604.8 | 1066.713 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 9635.7084 | -57.1663 | 4.0032 | 604.8 | 1066.713 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.329 | 201] 1.5 [DL + LL] | 10007.2811 | 73.0344 | 129.6393 |
| Bottom | 1.346 | 201] 1.5 [DL + LL] | 10133.2439 | -71.2172 | -76.9815 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10007.2811 | 129.6393 | -49.2284 | 405.8182 | 867.7312 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10133.2439 | -76.9815 | -49.2284 | 405.8182 | 867.7312 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.383 | 201] 1.5 [DL + LL] | 10479.8597 | 48.1818 | 54.6506 |
| Bottom | 1.391 | 201] 1.5 [DL + LL] | 10600.4241 | -24.5994 | -34.1924 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10479.8597 | 54.6506 | -22.0902 | 429.1485 | 891.0616 |
| Bottom | Leg 1 | 800 | 201] 1.5 [DL + LL] | 10600.4241 | -34.1924 | -22.0902 | 429.1485 | 891.0616 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.04 | 201] 1.5 [DL + LL] | 1948.5043 | 159.0025 | 745.3781 |
| Bottom | 1.228 | 201] 1.5 [DL + LL] | 2005.1875 | -143.6735 | -184.394 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1948.5043 | 745.3781 | -295.6582 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2005.1875 | -184.394 | -295.6582 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.087 | 201] 1.5 [DL + LL] | 2218.0993 | 127.0664 | 129.007 |
| Bottom | 1.112 | 201] 1.5 [DL + LL] | 2274.7826 | -128.4133 | -147.1691 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2218.0993 | 129.007 | -88.1075 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2274.7826 | -147.1691 | -88.1075 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.067 | 201] 1.5 [DL + LL] | 2489.1548 | 128.1859 | 160.1022 |
| Bottom | 1.058 | 201] 1.5 [DL + LL] | 2545.8381 | -126.2412 | -142.5873 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2489.1548 | 160.1022 | -96.567 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2545.8381 | -142.5873 | -96.567 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.083 | 201] 1.5 [DL + LL] | 2761.8327 | 122.9542 | 162.7127 |
| Bottom | 1.075 | 201] 1.5 [DL + LL] | 2818.516 | -121.4781 | -142.5758 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2761.8327 | 162.7127 | -97.4082 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2818.516 | -142.5758 | -97.4082 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.126 | 201] 1.5 [DL + LL] | 3036.5844 | 118.3451 | 159.8707 |
| Bottom | 1.117 | 201] 1.5 [DL + LL] | 3093.2677 | -116.6487 | -141.8242 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3036.5844 | 159.8707 | -96.2794 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3093.2677 | -141.8242 | -96.2794 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.15 | 201] 1.5 [DL + LL] | 3313.9553 | 113.1888 | 156.8911 |
| Bottom | 1.149 | 201] 1.5 [DL + LL] | 3370.6385 | -111.3532 | -140.3029 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3313.9553 | 156.8911 | -94.8606 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3370.6385 | -140.3029 | -94.8606 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.159 | 201] 1.5 [DL + LL] | 3594.4896 | 107.6202 | 153.7944 |
| Bottom | 1.157 | 201] 1.5 [DL + LL] | 3651.1729 | -105.6263 | -138.1004 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3594.4896 | 153.7944 | -93.1861 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3651.1729 | -138.1004 | -93.1861 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.191 | 201] 1.5 [DL + LL] | 3878.7382 | 101.5724 | 150.515 |
| Bottom | 1.19 | 201] 1.5 [DL + LL] | 3935.4214 | -99.415 | -135.2534 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3878.7382 | 150.515 | -91.2462 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3935.4214 | -135.2534 | -91.2462 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.223 | 201] 1.5 [DL + LL] | 4167.257 | 95.0328 | 147.02 |
| Bottom | 1.224 | 201] 1.5 [DL + LL] | 4223.9403 | -92.6893 | -132.2973 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4167.257 | 147.02 | -89.2 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4223.9403 | -132.2973 | -89.2 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.266 | 201] 1.5 [DL + LL] | 4460.6218 | 87.9959 | 142.7465 |
| Bottom | 1.27 | 201] 1.5 [DL + LL] | 4517.3051 | -85.5258 | -128.826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4460.6218 | 142.7465 | -86.7413 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4517.3051 | -128.826 | -86.7413 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.312 | 201] 1.5 [DL + LL] | 4759.4789 | 80.1614 | 137.9199 |
| Bottom | 1.306 | 201] 1.5 [DL + LL] | 4816.1621 | -77.6979 | -80.0212 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4759.4789 | 137.9199 | -69.6777 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4816.1621 | -80.0212 | -69.6777 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.365 | 201] 1.5 [DL + LL] | 5063.2514 | 71.017 | 180.7974 |
| Bottom | 1.404 | 201] 1.5 [DL + LL] | 5119.9346 | -67.0192 | -431.5316 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5063.2514 | 180.7974 | -194.9404 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5119.9346 | -431.5316 | -194.9404 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.268 | 201] 1.5 [DL + LL] | 5396.9315 | 75.2646 | 1403.8136 |
| Bottom | 1.082 | 201] 1.5 [DL + LL] | 5474.871 | -70.6841 | -166.9955 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5396.9315 | 1403.8136 | -499.3813 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5474.871 | -166.9955 | -499.3813 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.114 | 201] 1.5 [DL + LL] | 5734.3285 | 63.648 | 178.1202 |
| Bottom | 1.125 | 201] 1.5 [DL + LL] | 5812.268 | -62.8371 | -176.3826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5734.3285 | 178.1202 | -112.9471 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5812.268 | -176.3826 | -112.9471 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.164 | 201] 1.5 [DL + LL] | 6072.4602 | 60.7879 | 153.5173 |
| Bottom | 1.177 | 201] 1.5 [DL + LL] | 6150.3997 | -58.6405 | -144.9763 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6072.4602 | 153.5173 | -95.2064 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6150.3997 | -144.9763 | -95.2064 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.222 | 201] 1.5 [DL + LL] | 6411.9442 | 55.1666 | 171.3095 |
| Bottom | 1.236 | 201] 1.5 [DL + LL] | 6489.8837 | -53.1559 | -136.3764 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6411.9442 | 171.3095 | -98.1084 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6489.8837 | -136.3764 | -98.1084 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.281 | 201] 1.5 [DL + LL] | 6753.0473 | 49.3736 | 165.8356 |
| Bottom | 1.295 | 201] 1.5 [DL + LL] | 6830.9868 | -47.2098 | -129.4347 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6753.0473 | 165.8356 | -94.1333 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6830.9868 | -129.4347 | -94.1333 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.339 | 201] 1.5 [DL + LL] | 7096.2918 | 43.1114 | 157.4435 |
| Bottom | 1.353 | 201] 1.5 [DL + LL] | 7174.2313 | -40.7968 | -121.2372 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7096.2918 | 157.4435 | -88.8284 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7174.2313 | -121.2372 | -88.8284 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.398 | 201] 1.5 [DL + LL] | 7442.1924 | 36.3661 | 148.9648 |
| Bottom | 1.412 | 201] 1.5 [DL + LL] | 7520.1319 | -33.8877 | -110.961 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7442.1924 | 148.9648 | -82.8302 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7520.1319 | -110.961 | -82.8302 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.457 | 201] 1.5 [DL + LL] | 7791.0853 | 29.1352 | 141.0961 |
| Bottom | 1.471 | 201] 1.5 [DL + LL] | 7869.0247 | -26.8377 | -100.6276 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7791.0853 | 141.0961 | -76.9972 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7869.0247 | -100.6276 | -76.9972 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.516 | 201] 1.5 [DL + LL] | 8143.9227 | 20.6255 | 133.581 |
| Bottom | 1.53 | 201] 1.5 [DL + LL] | 8224.3364 | -17.6595 | -94.0455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8143.9227 | 133.581 | -70.2294 | 616.6286 | 997.7068 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8224.3364 | -94.0455 | -70.2294 | 616.6286 | 997.7068 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.928 | 201] 1.5 [DL + LL] | 8494.0885 | 252.8417 | 97.5604 |
| Bottom | 1.958 | 201] 1.5 [DL + LL] | 8598.0078 | -255.897 | -127.1512 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8494.0885 | 97.5604 | -53.6802 | 380.16 | 761.2383 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8598.0078 | -127.1512 | -53.6802 | 380.16 | 761.2383 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.959 | 201] 1.5 [DL + LL] | 8939.7953 | -240.5049 | 104.9311 |
| Bottom | 1.971 | 201] 1.5 [DL + LL] | 9039.261 | 243.1839 | 23.3622 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8939.7953 | 104.9311 | -20.4339 | 406.0088 | 787.0871 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9039.261 | 23.3622 | -20.4339 | 406.0088 | 787.0871 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.013 | 201] 1.5 [DL + LL] | 2040.3898 | -156.8565 | 794.2815 |
| Bottom | 1.234 | 201] 1.5 [DL + LL] | 2097.0731 | 141.7647 | -205.1536 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2040.3898 | 794.2815 | -317.7489 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2097.0731 | -205.1536 | -317.7489 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.082 | 201] 1.5 [DL + LL] | 2289.0696 | -125.8274 | 128.6005 |
| Bottom | 1.116 | 201] 1.5 [DL + LL] | 2345.7528 | 127.2557 | -158.8224 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2289.0696 | 128.6005 | -91.6509 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2345.7528 | -158.8224 | -91.6509 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.073 | 201] 1.5 [DL + LL] | 2540.896 | -127.3026 | 166.7928 |
| Bottom | 1.067 | 201] 1.5 [DL + LL] | 2597.5793 | 125.5665 | -152.4315 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2540.896 | 166.7928 | -101.7913 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2597.5793 | -152.4315 | -101.7913 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.089 | 201] 1.5 [DL + LL] | 2795.8486 | -122.4866 | 169.9489 |
| Bottom | 1.083 | 201] 1.5 [DL + LL] | 2852.5318 | 121.2567 | -151.6389 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2795.8486 | 169.9489 | -102.5551 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2852.5318 | -151.6389 | -102.5551 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.132 | 201] 1.5 [DL + LL] | 3054.2767 | -118.2588 | 166.8121 |
| Bottom | 1.125 | 201] 1.5 [DL + LL] | 3110.9599 | 116.8499 | -150.1342 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3054.2767 | 166.8121 | -101.091 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3110.9599 | -150.1342 | -101.091 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.153 | 201] 1.5 [DL + LL] | 3316.6507 | -113.4873 | 163.6315 |
| Bottom | 1.154 | 201] 1.5 [DL + LL] | 3373.3339 | 111.9721 | -148.0967 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3316.6507 | 163.6315 | -99.442 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3373.3339 | -148.0967 | -99.442 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.161 | 201] 1.5 [DL + LL] | 3583.4491 | -108.3199 | 160.2166 |
| Bottom | 1.162 | 201] 1.5 [DL + LL] | 3640.1323 | 106.6752 | -145.5724 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3583.4491 | 160.2166 | -97.5623 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3640.1323 | -145.5724 | -97.5623 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.193 | 201] 1.5 [DL + LL] | 3855.1749 | -102.704 | 156.5251 |
| Bottom | 1.193 | 201] 1.5 [DL + LL] | 3911.8581 | 100.9195 | -142.5758 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3855.1749 | 156.5251 | -95.4431 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3911.8581 | -142.5758 | -95.4431 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.224 | 201] 1.5 [DL + LL] | 4132.3543 | -96.644 | 152.5318 |
| Bottom | 1.224 | 201] 1.5 [DL + LL] | 4189.0376 | 94.6963 | -139.6712 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4132.3543 | 152.5318 | -93.2559 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4189.0376 | -139.6712 | -93.2559 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.263 | 201] 1.5 [DL + LL] | 4415.5597 | -90.1473 | 147.629 |
| Bottom | 1.268 | 201] 1.5 [DL + LL] | 4472.2429 | 88.0838 | -135.7227 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4415.5597 | 147.629 | -90.449 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4472.2429 | -135.7227 | -90.449 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.308 | 201] 1.5 [DL + LL] | 4705.4064 | -82.9087 | 142.7963 |
| Bottom | 1.305 | 201] 1.5 [DL + LL] | 4762.0896 | 80.8969 | -89.6624 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4705.4064 | 142.7963 | -74.2608 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4762.0896 | -89.6624 | -74.2608 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.36 | 201] 1.5 [DL + LL] | 5001.5259 | -74.5885 | 182.4632 |
| Bottom | 1.406 | 201] 1.5 [DL + LL] | 5058.2092 | 70.954 | -436.6454 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5001.5259 | 182.4632 | -197.0829 | 264.7742 | 541.922 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5058.2092 | -436.6454 | -197.0829 | 264.7742 | 541.922 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.269 | 201] 1.5 [DL + LL] | 5334.2334 | -79.9474 | 1385.2065 |
| Bottom | 1.08 | 201] 1.5 [DL + LL] | 5412.1729 | 75.7693 | -158.7547 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5334.2334 | 1385.2065 | -490.8744 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5412.1729 | -158.7547 | -490.8744 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.112 | 201] 1.5 [DL + LL] | 5670.4869 | -67.4558 | 192.1241 |
| Bottom | 1.122 | 201] 1.5 [DL + LL] | 5748.4264 | 67.0393 | -176.7579 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5670.4869 | 192.1241 | -117.515 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5748.4264 | -176.7579 | -117.515 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.158 | 201] 1.5 [DL + LL] | 6007.214 | -64.22 | 157.7351 |
| Bottom | 1.168 | 201] 1.5 [DL + LL] | 6085.1535 | 62.3371 | -146.3511 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6007.214 | 157.7351 | -96.9761 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6085.1535 | -146.3511 | -96.9761 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.212 | 201] 1.5 [DL + LL] | 6345.0307 | -58.1113 | 172.8469 |
| Bottom | 1.226 | 201] 1.5 [DL + LL] | 6422.9702 | 56.3776 | -136.6356 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6345.0307 | 172.8469 | -98.6716 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6422.9702 | -136.6356 | -98.6716 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.27 | 201] 1.5 [DL + LL] | 6684.2387 | -51.8402 | 166.8436 |
| Bottom | 1.284 | 201] 1.5 [DL + LL] | 6762.1782 | 49.9502 | -128.9826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6684.2387 | 166.8436 | -94.301 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6762.1782 | -128.9826 | -94.301 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.328 | 201] 1.5 [DL + LL] | 7025.3486 | -45.1359 | 157.5534 |
| Bottom | 1.342 | 201] 1.5 [DL + LL] | 7103.2881 | 43.1042 | -120.0935 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7025.3486 | 157.5534 | -88.49 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7103.2881 | -120.0935 | -88.49 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.386 | 201] 1.5 [DL + LL] | 7368.8693 | -37.9163 | 148.1628 |
| Bottom | 1.4 | 201] 1.5 [DL + LL] | 7446.8087 | 35.6688 | -109.0277 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7368.8693 | 148.1628 | -81.9504 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7446.8087 | -109.0277 | -81.9504 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.444 | 201] 1.5 [DL + LL] | 7715.1112 | -30.3777 | 139.484 |
| Bottom | 1.459 | 201] 1.5 [DL + LL] | 7793.0507 | 28.6243 | -98.7384 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7715.1112 | 139.484 | -75.8733 | 669.0316 | 1050.1098 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7793.0507 | -98.7384 | -75.8733 | 669.0316 | 1050.1098 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.502 | 201] 1.5 [DL + LL] | 8065.0765 | -20.6846 | 130.1954 |
| Bottom | 1.514 | 201] 1.5 [DL + LL] | 8145.4903 | 16.8914 | -103.2282 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8065.0765 | 130.1954 | -72.0098 | 616.6286 | 997.7068 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8145.4903 | -103.2282 | -72.0098 | 616.6286 | 997.7068 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.918 | 201] 1.5 [DL + LL] | 8404.744 | -252.4221 | 111.972 |
| Bottom | 1.947 | 201] 1.5 [DL + LL] | 8508.6633 | 255.4773 | -141.5757 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8404.744 | 111.972 | -60.5422 | 380.16 | 761.2383 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8508.6633 | -141.5757 | -60.5422 | 380.16 | 761.2383 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.927 | 201] 1.5 [DL + LL] | 8820.1578 | -233.6186 | 119.6125 |
| Bottom | 1.936 | 201] 1.5 [DL + LL] | 8919.6235 | 236.2976 | 14.6606 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8820.1578 | 119.6125 | -26.2417 | 406.0088 | 787.0871 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8919.6235 | 14.6606 | -26.2417 | 406.0088 | 787.0871 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.033 | 201] 1.5 [DL + LL] | 1320.7376 | -86.3191 | -170.7886 |
| Bottom | 0.796 | 201] 1.5 [DL + LL] | 1363.2501 | 75.9871 | -7.9583 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1320.7376 | -170.7886 | 51.4811 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1363.2501 | -7.9583 | 51.4811 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.814 | 201] 1.5 [DL + LL] | 1589.8786 | -70.3175 | 21.3849 |
| Bottom | 0.817 | 201] 1.5 [DL + LL] | 1632.391 | 71.2891 | -6.6467 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1589.8786 | 21.3849 | -9.2515 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1632.391 | -6.6467 | -9.2515 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.883 | 201] 1.5 [DL + LL] | 1858.1758 | -70.9275 | 24.6418 |
| Bottom | 0.884 | 201] 1.5 [DL + LL] | 1900.6882 | 70.1844 | -11.6815 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1858.1758 | 24.6418 | -11.8979 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1900.6882 | -11.6815 | -11.8979 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.944 | 201] 1.5 [DL + LL] | 2125.1744 | -69.1841 | 20.5765 |
| Bottom | 0.947 | 201] 1.5 [DL + LL] | 2167.6868 | 68.6033 | -11.66 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2125.1744 | 20.5765 | -10.6204 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2167.6868 | -11.66 | -10.6204 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.009 | 201] 1.5 [DL + LL] | 2390.8566 | -67.8914 | 21.3229 |
| Bottom | 1.011 | 201] 1.5 [DL + LL] | 2433.3691 | 67.2193 | -12.6573 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2390.8566 | 21.3229 | -11.1894 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2433.3691 | -12.6573 | -11.1894 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.077 | 201] 1.5 [DL + LL] | 2655.1595 | -66.4342 | 20.9598 |
| Bottom | 1.085 | 201] 1.5 [DL + LL] | 2697.6719 | 65.7583 | -13.4167 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2655.1595 | 20.9598 | -11.3274 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2697.6719 | -13.4167 | -11.3274 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.078 | 201] 1.5 [DL + LL] | 2917.9648 | -64.9736 | 20.6896 |
| Bottom | 1.085 | 201] 1.5 [DL + LL] | 2960.4772 | 64.2588 | -13.7979 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2917.9648 | 20.6896 | -11.3729 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2960.4772 | -13.7979 | -11.3729 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.147 | 201] 1.5 [DL + LL] | 3179.1633 | -63.4665 | 20.6934 |
| Bottom | 1.153 | 201] 1.5 [DL + LL] | 3221.6758 | 62.7215 | -13.6243 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3179.1633 | 20.6934 | -11.3251 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3221.6758 | -13.6243 | -11.3251 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.262 | 201] 1.5 [DL + LL] | 3438.6507 | -61.8548 | 21.2196 |
| Bottom | 1.267 | 201] 1.5 [DL + LL] | 3481.1632 | 61.077 | -11.6957 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3438.6507 | 21.2196 | -10.8752 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3481.1632 | -11.6957 | -10.8752 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.333 | 201] 1.5 [DL + LL] | 3696.3448 | -60.1378 | 23.6527 |
| Bottom | 1.341 | 201] 1.5 [DL + LL] | 3738.8573 | 59.1798 | -20.8884 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3696.3448 | 23.6527 | -14.5527 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3738.8573 | -20.8884 | -14.5527 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.346 | 201] 1.5 [DL + LL] | 3952.1374 | -58.8002 | 14.5118 |
| Bottom | 1.371 | 201] 1.5 [DL + LL] | 3994.6498 | 56.6581 | -54.2101 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3952.1374 | 14.5118 | -22.3431 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3994.6498 | -54.2101 | -22.3431 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.426 | 201] 1.5 [DL + LL] | 4204.1354 | -58.8369 | -23.4849 |
| Bottom | 1.524 | 201] 1.5 [DL + LL] | 4246.6479 | 62.9855 | 263.0985 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4204.1354 | -23.4849 | 90.6146 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4246.6479 | 263.0985 | 90.6146 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.447 | 201] 1.5 [DL + LL] | 4476.9581 | -111.1444 | -742.051 |
| Bottom | 1.231 | 201] 1.5 [DL + LL] | 4537.1841 | 100.4281 | -51.4746 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4476.9581 | -742.051 | 219.2632 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4537.1841 | -51.4746 | 219.2632 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.265 | 201] 1.5 [DL + LL] | 4759.7241 | -98.9323 | -14.1847 |
| Bottom | 1.28 | 201] 1.5 [DL + LL] | 4819.9501 | 98.1785 | 34.6734 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4759.7241 | -14.1847 | 14.9564 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4819.9501 | 34.6734 | 14.9564 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.329 | 201] 1.5 [DL + LL] | 5041.917 | -95.8178 | 74.5699 |
| Bottom | 1.322 | 201] 1.5 [DL + LL] | 5102.143 | 94.7516 | -8.0067 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5041.917 | 74.5699 | -26.5993 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5102.143 | -8.0067 | -26.5993 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.369 | 201] 1.5 [DL + LL] | 5322.3415 | -92.5951 | 35.1196 |
| Bottom | 1.373 | 201] 1.5 [DL + LL] | 5382.5675 | 91.1798 | -17.6654 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5322.3415 | 35.1196 | -17.0667 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5382.5675 | -17.6654 | -17.0667 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.417 | 201] 1.5 [DL + LL] | 5600.3562 | -89.6884 | 26.8491 |
| Bottom | 1.421 | 201] 1.5 [DL + LL] | 5660.5822 | 87.9922 | -15.5398 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5600.3562 | 26.8491 | -13.7514 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5660.5822 | -15.5398 | -13.7514 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.466 | 201] 1.5 [DL + LL] | 5875.868 | -86.2422 | 30.3595 |
| Bottom | 1.475 | 201] 1.5 [DL + LL] | 5936.094 | 84.4088 | -13.9612 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5875.868 | 30.3595 | -14.3392 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5936.094 | -13.9612 | -14.3392 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.522 | 201] 1.5 [DL + LL] | 6148.8096 | -82.7283 | 33.7129 |
| Bottom | 1.535 | 201] 1.5 [DL + LL] | 6209.0356 | 80.9614 | -15.4388 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6148.8096 | 33.7129 | -15.8298 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6209.0356 | -15.4388 | -15.8298 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.581 | 201] 1.5 [DL + LL] | 6419.0909 | -78.4059 | 34.2771 |
| Bottom | 1.593 | 201] 1.5 [DL + LL] | 6479.3168 | 74.8212 | -7.9324 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6419.0909 | 34.2771 | -13.5706 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6479.3168 | -7.9324 | -13.5706 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.643 | 201] 1.5 [DL + LL] | 6686.7901 | -78.026 | 44.1225 |
| Bottom | 1.664 | 201] 1.5 [DL + LL] | 6748.928 | 85.7773 | 82.6079 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6686.7901 | 44.1225 | 11.8851 | 293.1677 | 587.6373 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6748.928 | 82.6079 | 11.8851 | 293.1677 | 587.6373 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.273 | 201] 1.5 [DL + LL] | 7174.2645 | -251.1894 | -153.7515 |
| Bottom | 2.287 | 201] 1.5 [DL + LL] | 7254.5658 | 253.5502 | 120.1676 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7174.2645 | -153.7515 | 65.2001 | 216.648 | 511.1176 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7254.5658 | 120.1676 | 65.2001 | 216.648 | 511.1176 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.123 | 201] 1.5 [DL + LL] | 7773.3649 | -177.5663 | -86.604 |
| Bottom | 2.139 | 201] 1.5 [DL + LL] | 7850.2247 | 179.6364 | 56.6378 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7773.3649 | -86.604 | 35.5814 | 226.3345 | 520.804 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7850.2247 | 56.6378 | 35.5814 | 226.3345 | 520.804 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.915 | 201] 1.5 [DL + LL] | 2061.3729 | 46.466 | -226.6724 |
| Bottom | 0.829 | 201] 1.5 [DL + LL] | 2103.8853 | -44.6776 | -36.0148 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2061.3729 | -226.6724 | 60.1417 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2103.8853 | -36.0148 | 60.1417 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.913 | 201] 1.5 [DL + LL] | 2303.1898 | 41.1596 | 134.6146 |
| Bottom | 0.904 | 201] 1.5 [DL + LL] | 2345.7022 | -41.5957 | -85.6936 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2303.1898 | 134.6146 | -70.4346 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2345.7022 | -85.6936 | -70.4346 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.972 | 201] 1.5 [DL + LL] | 2553.0483 | 42.2649 | 82.4336 |
| Bottom | 0.983 | 201] 1.5 [DL + LL] | 2595.5607 | -41.8823 | -77.561 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2553.0483 | 82.4336 | -51.2813 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2595.5607 | -77.561 | -51.2813 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.052 | 201] 1.5 [DL + LL] | 2808.8409 | 41.5466 | 85.847 |
| Bottom | 1.062 | 201] 1.5 [DL + LL] | 2851.3534 | -41.3434 | -75.9905 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2808.8409 | 85.847 | -51.8807 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2851.3534 | -75.9905 | -51.8807 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.06 | 201] 1.5 [DL + LL] | 3071.2771 | 41.008 | 82.6013 |
| Bottom | 1.069 | 201] 1.5 [DL + LL] | 3113.7896 | -40.7384 | -73.997 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3071.2771 | 82.6013 | -50.2247 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3113.7896 | -73.997 | -50.2247 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.136 | 201] 1.5 [DL + LL] | 3340.646 | 40.3395 | 79.4995 |
| Bottom | 1.145 | 201] 1.5 [DL + LL] | 3383.1584 | -40.0227 | -71.6615 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3340.646 | 79.4995 | -48.5054 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3383.1584 | -71.6615 | -48.5054 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 201] 1.5 [DL + LL] | 3617.4137 | 39.568 | 76.3568 |
| Bottom | 1.222 | 201] 1.5 [DL + LL] | 3659.9262 | -39.2067 | -68.9646 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3617.4137 | 76.3568 | -46.6573 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3659.9262 | -68.9646 | -46.6573 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.297 | 201] 1.5 [DL + LL] | 3902.0699 | 38.6802 | 73.1943 |
| Bottom | 1.311 | 201] 1.5 [DL + LL] | 3944.5823 | -38.2794 | -65.9098 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3902.0699 | 73.1943 | -44.6867 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3944.5823 | -65.9098 | -44.6867 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.39 | 201] 1.5 [DL + LL] | 4195.1706 | 37.696 | 69.9793 |
| Bottom | 1.404 | 201] 1.5 [DL + LL] | 4237.683 | -37.2322 | -62.825 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4195.1706 | 69.9793 | -42.6864 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4237.683 | -62.825 | -42.6864 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.486 | 201] 1.5 [DL + LL] | 4497.3198 | 36.6777 | 66.3287 |
| Bottom | 1.501 | 201] 1.5 [DL + LL] | 4539.8322 | -36.3592 | -52.8634 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4497.3198 | 66.3287 | -38.349 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4539.8322 | -52.8634 | -38.349 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.583 | 201] 1.5 [DL + LL] | 4808.9894 | 34.8524 | 69.6406 |
| Bottom | 1.592 | 201] 1.5 [DL + LL] | 4851.5018 | -34.3445 | -113.6098 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4808.9894 | 69.6406 | -58.7346 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4851.5018 | -113.6098 | -58.7346 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.693 | 201] 1.5 [DL + LL] | 5132.3128 | 33.947 | -3.8669 |
| Bottom | 1.708 | 201] 1.5 [DL + LL] | 5174.8253 | -33.4722 | 261.7258 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5132.3128 | -3.8669 | 83.8743 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5174.8253 | 261.7258 | 83.8743 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.488 | 201] 1.5 [DL + LL] | 5449.1458 | 56.8339 | -959.907 |
| Bottom | 1.34 | 201] 1.5 [DL + LL] | 5509.3717 | -51.5723 | 57.0038 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5449.1458 | -959.907 | 322.6853 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5509.3717 | 57.0038 | 322.6853 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.394 | 201] 1.5 [DL + LL] | 5786.5388 | 42.9948 | 98.2295 |
| Bottom | 1.415 | 201] 1.5 [DL + LL] | 5846.7647 | -44.6704 | 1.928 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5786.5388 | 98.2295 | -31.1228 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5846.7647 | 1.928 | -31.1228 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.482 | 201] 1.5 [DL + LL] | 6131.8087 | 47.1425 | 38.5649 |
| Bottom | 1.497 | 201] 1.5 [DL + LL] | 6192.0347 | -46.4073 | -11.7965 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6131.8087 | 38.5649 | -16.3937 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6192.0347 | -11.7965 | -16.3937 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.566 | 201] 1.5 [DL + LL] | 6485.7767 | 46.9176 | 17.283 |
| Bottom | 1.581 | 201] 1.5 [DL + LL] | 6546.0027 | -46.6744 | -4.9842 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6485.7767 | 17.283 | -7.4506 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6546.0027 | -4.9842 | -7.4506 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.652 | 201] 1.5 [DL + LL] | 6849.0787 | 47.032 | 15.2288 |
| Bottom | 1.666 | 201] 1.5 [DL + LL] | 6909.3047 | -46.8316 | 0.2557 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6849.0787 | 15.2288 | -5.1083 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6909.3047 | 0.2557 | -5.1083 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.74 | 201] 1.5 [DL + LL] | 7222.2757 | 47.1379 | 11.1536 |
| Bottom | 1.754 | 201] 1.5 [DL + LL] | 7282.5017 | -46.8985 | 5.8272 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7222.2757 | 11.1536 | -2.0073 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7282.5017 | 5.8272 | -2.0073 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.83 | 201] 1.5 [DL + LL] | 7606.1341 | 47.4711 | 6.7814 |
| Bottom | 1.844 | 201] 1.5 [DL + LL] | 7666.36 | -47.5686 | 13.8692 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7606.1341 | 6.7814 | 1.986 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7666.36 | 13.8692 | 1.986 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.922 | 201] 1.5 [DL + LL] | 8001.5287 | 46.6976 | 4.151 |
| Bottom | 1.935 | 201] 1.5 [DL + LL] | 8061.7546 | -45.6471 | 14.0063 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8001.5287 | 4.151 | 2.9364 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8061.7546 | 14.0063 | 2.9364 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.021 | 201] 1.5 [DL + LL] | 8408.8348 | 50.1822 | -7.0149 |
| Bottom | 2.04 | 201] 1.5 [DL + LL] | 8470.9727 | -55.7666 | 25.8379 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8408.8348 | -7.0149 | 9.9709 | 293.1677 | 587.6373 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8470.9727 | 25.8379 | 9.9709 | 293.1677 | 587.6373 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.423 | 201] 1.5 [DL + LL] | 8864.862 | 235.0871 | -21.2447 |
| Bottom | 2.444 | 201] 1.5 [DL + LL] | 8945.1633 | -237.4479 | 11.11 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8864.862 | -21.2447 | 7.5687 | 216.648 | 511.1176 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8945.1633 | 11.11 | 7.5687 | 216.648 | 511.1176 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.669 | 201] 1.5 [DL + LL] | 9531.7224 | 276.2824 | -12.8551 |
| Bottom | 2.697 | 201] 1.5 [DL + LL] | 9608.5822 | -278.3525 | 33.1769 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9531.7224 | -12.8551 | 11.3163 | 226.3345 | 520.804 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9608.5822 | 33.1769 | 11.3163 | 226.3345 | 520.804 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.017 | 201] 1.5 [DL + LL] | 356.4971 | 214.0998 | 151.0333 |
| Bottom | 2.075 | 201] 1.5 [DL + LL] | 643.7671 | -117.2712 | 584.5073 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 356.4971 | 151.0333 | 98.9953 | 3159.6 | 4172.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 643.7671 | 584.5073 | 98.9953 | 3159.6 | 4172.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.296 | 201] 1.5 [DL + LL] | 707.5943 | 55.5849 | 587.0305 |
| Bottom | 1.044 | 201] 1.5 [DL + LL] | 928.1471 | -103.6455 | 1056.4525 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 707.5943 | 587.0305 | 138.7477 | 3500.4 | 4512.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 928.1471 | 1056.4525 | 136.796 | 3500.4 | 4512.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.879 | 201] 1.5 [DL + LL] | 1080.8969 | 109.8882 | 917.6447 |
| Bottom | 1.404 | 201] 1.5 [DL + LL] | 1319.5878 | -149.0534 | 1261.2637 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1080.8969 | 917.6447 | 86.8621 | 3440.4 | 4452.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1319.5878 | 1261.2637 | 85.9337 | 3440.4 | 4452.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.615 | 201] 1.5 [DL + LL] | 1680.1279 | 135.4846 | 1008.4854 |
| Bottom | 0.911 | 201] 1.5 [DL + LL] | 1918.9519 | -171.2382 | 1183.394 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1680.1279 | 1008.4854 | 29.6499 | 3464.4 | 4476.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1918.9519 | 1183.394 | 29.516 | 3464.4 | 4476.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.57 | 201] 1.5 [DL + LL] | 2334.9041 | 168.0226 | 1025.8227 |
| Bottom | 0.545 | 201] 1.5 [DL + LL] | 2577.0736 | -173.4884 | 1065.86 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2334.9041 | 1025.8227 | -13.9532 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2577.0736 | 1065.86 | -13.849 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.456 | 201] 1.5 [DL + LL] | 2985.4729 | 164.6021 | 933.2834 |
| Bottom | 0.479 | 201] 1.5 [DL + LL] | 3228.2125 | -173.9487 | 943.6954 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2985.4729 | 933.2834 | -23.8963 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3228.2125 | 943.6954 | -23.7792 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.441 | 201] 1.5 [DL + LL] | 3629.8731 | 160.4517 | 833.0783 |
| Bottom | 0.473 | 201] 1.5 [DL + LL] | 3872.904 | -173.845 | 849.6176 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3629.8731 | 833.0783 | -22.2369 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3872.904 | 849.6176 | -22.1475 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.456 | 201] 1.5 [DL + LL] | 4268.6528 | 157.0924 | 757.8088 |
| Bottom | 0.488 | 201] 1.5 [DL + LL] | 4511.8249 | -170.5018 | 772.1501 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4268.6528 | 757.8088 | -23.0887 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4511.8249 | 772.1501 | -23.0218 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.475 | 201] 1.5 [DL + LL] | 4914.66 | 152.4593 | 610.4917 |
| Bottom | 0.518 | 201] 1.5 [DL + LL] | 5158.0453 | -172.3491 | 772.6704 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4914.66 | 610.4917 | 23.6463 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5158.0453 | 772.6704 | 23.6809 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.509 | 201] 1.5 [DL + LL] | 5565.0253 | 150.2675 | 591.1117 |
| Bottom | 0.543 | 201] 1.5 [DL + LL] | 5808.4857 | -166.6158 | 643.912 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5565.0253 | 591.1117 | -11.1567 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5808.4857 | 643.912 | -11.1259 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.543 | 201] 1.5 [DL + LL] | 6209.5351 | 152.307 | 479.5001 |
| Bottom | 0.574 | 201] 1.5 [DL + LL] | 6452.9334 | -165.1505 | 545.2477 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6209.5351 | 479.5001 | -7.0253 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6452.9334 | 545.2477 | -6.9957 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.578 | 201] 1.5 [DL + LL] | 6849.6719 | 149.7199 | 391.4666 |
| Bottom | 0.608 | 201] 1.5 [DL + LL] | 7092.9427 | -163.9758 | 476.2511 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6849.6719 | 391.4666 | -0.9077 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7092.9427 | 476.2511 | -0.882 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.614 | 201] 1.5 [DL + LL] | 7485.3754 | 146.1284 | 332.0214 |
| Bottom | 0.646 | 201] 1.5 [DL + LL] | 7728.4907 | -162.1488 | 427.9806 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7485.3754 | 332.0214 | 2.7391 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7728.4907 | 427.9806 | 2.7611 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.651 | 201] 1.5 [DL + LL] | 8116.7256 | 142.54 | 291.9182 |
| Bottom | 0.684 | 201] 1.5 [DL + LL] | 8359.6726 | -159.8182 | 392.0447 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8116.7256 | 291.9182 | 4.1759 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8359.6726 | 392.0447 | 4.1952 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.687 | 201] 1.5 [DL + LL] | 8743.703 | 138.7741 | 263.1384 |
| Bottom | 0.721 | 201] 1.5 [DL + LL] | 8986.4818 | -157.0492 | 363.497 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8743.703 | 263.1384 | 4.3689 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8986.4818 | 363.497 | 4.3863 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.723 | 201] 1.5 [DL + LL] | 9366.2533 | 134.7244 | 240.8932 |
| Bottom | 0.758 | 201] 1.5 [DL + LL] | 9608.8732 | -153.7976 | 341.0072 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9366.2533 | 240.8932 | 4.4096 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9608.8732 | 341.0072 | 4.4254 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.759 | 201] 1.5 [DL + LL] | 9984.2908 | 130.3974 | 223.9655 |
| Bottom | 0.794 | 201] 1.5 [DL + LL] | 10226.7698 | -150.1075 | 327.8816 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9984.2908 | 223.9655 | 5.7272 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10226.7698 | 327.8816 | 5.7417 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.797 | 201] 1.5 [DL + LL] | 10597.7225 | 125.7463 | 215.7283 |
| Bottom | 0.83 | 201] 1.5 [DL + LL] | 10840.0889 | -145.8549 | 336.3422 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10597.7225 | 215.7283 | 11.1245 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10840.0889 | 336.3422 | 11.1378 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.839 | 201] 1.5 [DL + LL] | 11206.3473 | 120.7488 | 228.7939 |
| Bottom | 0.863 | 201] 1.5 [DL + LL] | 11448.6274 | -136.7019 | 361.2374 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11206.3473 | 228.7939 | 14.9717 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11448.6274 | 361.2374 | 14.9833 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.881 | 201] 1.5 [DL + LL] | 11809.5892 | 119.3933 | 258.6143 |
| Bottom | 0.903 | 201] 1.5 [DL + LL] | 12051.8213 | -133.2498 | 346.8922 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11809.5892 | 258.6143 | 1.0478 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12051.8213 | 346.8922 | 1.0399 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.924 | 201] 1.5 [DL + LL] | 12410.4126 | 119.2243 | 249.8295 |
| Bottom | 0.949 | 201] 1.5 [DL + LL] | 12652.6977 | -143.7415 | 304.9917 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12410.4126 | 249.8295 | -9.4556 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12652.6977 | 304.9917 | -9.4428 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.961 | 201] 1.5 [DL + LL] | 13008.3135 | 99.3423 | 203.0217 |
| Bottom | 0.989 | 201] 1.5 [DL + LL] | 13250.1702 | -135.5931 | 290.2671 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13008.3135 | 203.0217 | 1.093 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13250.1702 | 290.2671 | 1.106 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.996 | 201] 1.5 [DL + LL] | 13604.398 | 100.5144 | 183.646 |
| Bottom | 1.022 | 201] 1.5 [DL + LL] | 13846.0699 | -129.9985 | 320.4652 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13604.398 | 183.646 | 17.0198 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13846.0699 | 320.4652 | 17.0253 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.038 | 201] 1.5 [DL + LL] | 14199.1457 | 98.6804 | 207.3342 |
| Bottom | 1.063 | 201] 1.5 [DL + LL] | 14440.6482 | -126.1229 | 331.3922 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14199.1457 | 207.3342 | 13.1688 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14440.6482 | 331.3922 | 13.1725 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.079 | 201] 1.5 [DL + LL] | 14792.3869 | 94.272 | 211.7116 |
| Bottom | 1.104 | 201] 1.5 [DL + LL] | 15033.7249 | -122.2092 | 316.1361 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14792.3869 | 211.7116 | 7.1457 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15033.7249 | 316.1361 | 7.1493 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.119 | 201] 1.5 [DL + LL] | 15384.1477 | 89.2799 | 189.1149 |
| Bottom | 1.145 | 201] 1.5 [DL + LL] | 15625.3333 | -118.0635 | 268.7664 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15384.1477 | 189.1149 | -0.515 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15625.3333 | 268.7664 | -0.5109 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.145 | 201] 1.5 [DL + LL] | 15974.5526 | 83.8125 | 133.1156 |
| Bottom | 1.171 | 201] 1.5 [DL + LL] | 16215.6004 | -112.4803 | 175.1867 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15974.5526 | 133.1156 | -12.2641 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16215.6004 | 175.1867 | -12.2578 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.186 | 201] 1.5 [DL + LL] | 16563.8449 | 79.4096 | 29.1349 |
| Bottom | 1.211 | 201] 1.5 [DL + LL] | 16804.7112 | -105.9492 | 39.4446 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16563.8449 | 29.1349 | -22.1675 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16804.7112 | 39.4446 | -22.1643 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.225 | 201] 1.5 [DL + LL] | 17143.97 | 76.5764 | -108.9876 |
| Bottom | 1.245 | 201] 1.5 [DL + LL] | 17391.5622 | -84.7834 | -26.5021 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17143.97 | -108.9876 | 0.5175 | 3428.4 | 4440.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17391.5622 | -26.5021 | 0.5692 | 3428.4 | 4440.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.613 | 201] 1.5 [DL + LL] | 17874.1812 | 553.507 | 332.1054 |
| Bottom | 1.632 | 201] 1.5 [DL + LL] | 18183.9313 | -562.6136 | 118.1254 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17874.1812 | 332.1054 | -70.055 | 3200.4 | 4212.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18183.9313 | 118.1254 | -70.062 | 3200.4 | 4212.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.644 | 201] 1.5 [DL + LL] | 18642.7204 | 537.6949 | 519.6529 |
| Bottom | 1.684 | 201] 1.5 [DL + LL] | 18940.5729 | -545.7172 | 895.4145 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18642.7204 | 519.6529 | 73.7115 | 3243.6 | 4256.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18940.5729 | 895.4145 | 73.7146 | 3243.6 | 4256.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 7.474 | 201] 1.5 [DL + LL] | 275.1129 | -245.023 | 336.9167 |
| Bottom | 6.251 | 201] 1.5 [DL + LL] | 562.3828 | 240.9266 | 238.9072 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 275.1129 | 336.9167 | -22.5388 | 3159.6 | 4172.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 562.3828 | 238.9072 | -22.5388 | 3159.6 | 4172.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.154 | 201] 1.5 [DL + LL] | 805.2324 | -226.2873 | 584.0265 |
| Bottom | 3.585 | 201] 1.5 [DL + LL] | 1040.0915 | 207.1984 | 445.7942 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 805.2324 | 584.0265 | -80.2331 | 3500.4 | 4512.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1040.0915 | 445.7942 | -78.2814 | 3500.4 | 4512.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.245 | 201] 1.5 [DL + LL] | 1408.4034 | -170.7757 | 374.7069 |
| Bottom | 0.446 | 201] 1.5 [DL + LL] | 1657.9926 | 137.2713 | 388.3508 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1408.4034 | 374.7069 | -25.1442 | 3440.4 | 4452.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1657.9926 | 388.3508 | -24.2158 | 3440.4 | 4452.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.511 | 201] 1.5 [DL + LL] | 1984.8187 | -168.2666 | 240.0569 |
| Bottom | 0.646 | 201] 1.5 [DL + LL] | 2221.1276 | 187.9073 | 576.6751 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1984.8187 | 240.0569 | 83.5369 | 3464.4 | 4476.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2221.1276 | 576.6751 | 83.6707 | 3464.4 | 4476.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.475 | 201] 1.5 [DL + LL] | 2605.6047 | -177.599 | 508.8434 |
| Bottom | 0.495 | 201] 1.5 [DL + LL] | 2845.1417 | 182.2674 | 709.7395 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2605.6047 | 508.8434 | 39.1381 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2845.1417 | 709.7395 | 39.0339 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.466 | 201] 1.5 [DL + LL] | 3227.0037 | -178.5257 | 651.9853 |
| Bottom | 0.486 | 201] 1.5 [DL + LL] | 3465.9707 | 184.2904 | 738.4813 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3227.0037 | 651.9853 | 3.139 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3465.9707 | 738.4813 | 3.0219 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.462 | 201] 1.5 [DL + LL] | 3844.2089 | -173.1457 | 695.8794 |
| Bottom | 0.491 | 201] 1.5 [DL + LL] | 4082.8847 | 184.3462 | 721.8052 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3844.2089 | 695.8794 | -15.9693 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4082.8847 | 721.8052 | -16.0588 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.479 | 201] 1.5 [DL + LL] | 4457.5563 | -169.2813 | 692.9524 |
| Bottom | 0.506 | 201] 1.5 [DL + LL] | 4696.0908 | 180.9079 | 675.0438 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4457.5563 | 692.9524 | -29.8479 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4696.0908 | 675.0438 | -29.9148 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.498 | 201] 1.5 [DL + LL] | 5081.3029 | -165.1636 | 573.9113 |
| Bottom | 0.536 | 201] 1.5 [DL + LL] | 5319.6242 | 183.3806 | 688.5615 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5081.3029 | 573.9113 | 12.323 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5319.6242 | 688.5615 | 12.2884 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.53 | 201] 1.5 [DL + LL] | 5710.9695 | -162.4718 | 563.1984 |
| Bottom | 0.561 | 201] 1.5 [DL + LL] | 5949.2156 | 177.8502 | 579.3957 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5710.9695 | 563.1984 | -18.9025 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5949.2156 | 579.3957 | -18.9333 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.563 | 201] 1.5 [DL + LL] | 6336.3366 | -163.7459 | 467.3217 |
| Bottom | 0.592 | 201] 1.5 [DL + LL] | 6574.6448 | 176.1434 | 498.793 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6336.3366 | 467.3217 | -14.1236 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6574.6448 | 498.793 | -14.1532 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.594 | 201] 1.5 [DL + LL] | 6958.8497 | -160.3738 | 393.7846 |
| Bottom | 0.622 | 201] 1.5 [DL + LL] | 7197.2854 | 174.5177 | 440.5079 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6958.8497 | 393.7846 | -9.3965 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7197.2854 | 440.5079 | -9.4222 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.629 | 201] 1.5 [DL + LL] | 7578.3986 | -156.0281 | 341.7646 |
| Bottom | 0.659 | 201] 1.5 [DL + LL] | 7816.9899 | 172.1533 | 398.0303 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7578.3986 | 341.7646 | -6.4978 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7816.9899 | 398.0303 | -6.5198 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.664 | 201] 1.5 [DL + LL] | 8194.9921 | -151.6798 | 304.3344 |
| Bottom | 0.696 | 201] 1.5 [DL + LL] | 8433.7516 | 169.2167 | 364.8971 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8194.9921 | 304.3344 | -5.2678 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8433.7516 | 364.8971 | -5.2871 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.699 | 201] 1.5 [DL + LL] | 8808.5533 | -147.1722 | 275.3103 |
| Bottom | 0.732 | 201] 1.5 [DL + LL] | 9047.481 | 165.8049 | 337.0661 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8808.5533 | 275.3103 | -5.0172 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9047.481 | 337.0661 | -5.0346 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.733 | 201] 1.5 [DL + LL] | 9418.9716 | -142.4059 | 250.76 |
| Bottom | 0.767 | 201] 1.5 [DL + LL] | 9658.0583 | 161.889 | 313.5991 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9418.9716 | 250.76 | -4.7895 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9658.0583 | 313.5991 | -4.8053 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.768 | 201] 1.5 [DL + LL] | 10026.1079 | -137.4049 | 229.8228 |
| Bottom | 0.802 | 201] 1.5 [DL + LL] | 10265.3355 | 157.5237 | 297.8839 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10026.1079 | 229.8228 | -3.23 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10265.3355 | 297.8839 | -3.2445 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.802 | 201] 1.5 [DL + LL] | 10629.8153 | -132.1537 | 215.9375 |
| Bottom | 0.837 | 201] 1.5 [DL + LL] | 10869.1555 | 152.6267 | 301.9075 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10629.8153 | 215.9375 | 2.3829 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 10869.1555 | 301.9075 | 2.3696 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.842 | 201] 1.5 [DL + LL] | 11229.8463 | -126.6067 | 221.4035 |
| Bottom | 0.868 | 201] 1.5 [DL + LL] | 11469.2727 | 143.0174 | 321.4656 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11229.8463 | 221.4035 | 6.8151 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11469.2727 | 321.4656 | 6.8035 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.884 | 201] 1.5 [DL + LL] | 11825.5495 | -124.4684 | 242.4928 |
| Bottom | 0.905 | 201] 1.5 [DL + LL] | 12065.0239 | 137.0836 | 314.739 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 11825.5495 | 242.4928 | -2.017 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12065.0239 | 314.739 | -2.0091 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.926 | 201] 1.5 [DL + LL] | 12418.3568 | -123.2094 | 234.9796 |
| Bottom | 0.951 | 201] 1.5 [DL + LL] | 12657.7783 | 148.8314 | 302.4859 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12418.3568 | 234.9796 | -3.4236 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 12657.7783 | 302.4859 | -3.4364 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.962 | 201] 1.5 [DL + LL] | 13008.8727 | -100.243 | 214.772 |
| Bottom | 0.99 | 201] 1.5 [DL + LL] | 13248.7225 | 138.078 | 294.9567 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13008.8727 | 214.772 | 0.3375 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13248.7225 | 294.9567 | 0.3246 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.996 | 201] 1.5 [DL + LL] | 13598.7901 | -101.4906 | 199.7361 |
| Bottom | 1.022 | 201] 1.5 [DL + LL] | 13838.8248 | 131.7715 | 323.1758 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13598.7901 | 199.7361 | 13.9834 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 13838.8248 | 323.1758 | 13.9779 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.037 | 201] 1.5 [DL + LL] | 14187.9953 | -98.7312 | 219.2041 |
| Bottom | 1.062 | 201] 1.5 [DL + LL] | 14428.1993 | 127.0415 | 332.7217 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14187.9953 | 219.2041 | 10.7853 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14428.1993 | 332.7217 | 10.7816 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.077 | 201] 1.5 [DL + LL] | 14776.2255 | -93.4464 | 219.8709 |
| Bottom | 1.103 | 201] 1.5 [DL + LL] | 15016.5941 | 122.2436 | 317.2948 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 14776.2255 | 219.8709 | 5.6453 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15016.5941 | 317.2948 | 5.6417 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.117 | 201] 1.5 [DL + LL] | 15363.433 | -87.5764 | 194.7681 |
| Bottom | 1.143 | 201] 1.5 [DL + LL] | 15603.9539 | 117.131 | 269.605 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15363.433 | 194.7681 | -1.544 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15603.9539 | 269.605 | -1.5481 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.143 | 201] 1.5 [DL + LL] | 15949.6395 | -81.3614 | 136.1843 |
| Bottom | 1.168 | 201] 1.5 [DL + LL] | 16190.2982 | 111.1266 | 173.9628 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 15949.6395 | 136.1843 | -13.327 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16190.2982 | 173.9628 | -13.3333 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.182 | 201] 1.5 [DL + LL] | 16535.0616 | -75.2461 | 27.4693 |
| Bottom | 1.207 | 201] 1.5 [DL + LL] | 16775.9018 | 101.3623 | 32.0264 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16535.0616 | 27.4693 | -23.9645 | 3452.4 | 4464.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 16775.9018 | 32.0264 | -23.9677 | 3452.4 | 4464.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.222 | 201] 1.5 [DL + LL] | 17111.5106 | -75.092 | -117.9864 |
| Bottom | 1.244 | 201] 1.5 [DL + LL] | 17358.7724 | 89.3859 | -42.1861 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17111.5106 | -117.9864 | -1.2485 | 3428.4 | 4440.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17358.7724 | -42.1861 | -1.3002 | 3428.4 | 4440.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.548 | 201] 1.5 [DL + LL] | 17845.1209 | -498.0346 | 320.2395 |
| Bottom | 1.566 | 201] 1.5 [DL + LL] | 18155.1247 | 507.1487 | 75.5735 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 17845.1209 | 320.2395 | -77.5159 | 3200.4 | 4212.8557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18155.1247 | 75.5735 | -77.5089 | 3200.4 | 4212.8557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.571 | 201] 1.5 [DL + LL] | 18574.9918 | -468.6607 | 575.0498 |
| Bottom | 1.604 | 201] 1.5 [DL + LL] | 18873.228 | 476.6934 | 905.8217 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18574.9918 | 575.0498 | 62.2989 | 3243.6 | 4256.0557 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 18873.228 | 905.8217 | 62.2958 | 3243.6 | 4256.0557 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.024 | 201] 1.5 [DL + LL] | 2105.6021 | -49.7826 | -339.4736 |
| Bottom | 0.853 | 201] 1.5 [DL + LL] | 2151.6573 | 47.8331 | -26.8628 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2105.6021 | -339.4736 | 98.9515 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2151.6573 | -26.8628 | 98.9515 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.944 | 201] 1.5 [DL + LL] | 2359.7665 | -44.6496 | 130.3829 |
| Bottom | 0.934 | 201] 1.5 [DL + LL] | 2405.8217 | 45.0836 | -78.3495 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2359.7665 | 130.3829 | -66.7039 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2405.8217 | -78.3495 | -66.7039 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.005 | 201] 1.5 [DL + LL] | 2620.6474 | -45.9065 | 76.276 |
| Bottom | 1.017 | 201] 1.5 [DL + LL] | 2666.7025 | 45.5796 | -71.3444 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2620.6474 | 76.276 | -47.3002 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2666.7025 | -71.3444 | -47.3002 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.087 | 201] 1.5 [DL + LL] | 2886.0895 | -45.2686 | 79.0477 |
| Bottom | 1.099 | 201] 1.5 [DL + LL] | 2932.1446 | 45.1721 | -69.2618 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2886.0895 | 79.0477 | -47.5359 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2932.1446 | -69.2618 | -47.5359 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.096 | 201] 1.5 [DL + LL] | 3156.7801 | -44.7889 | 76.6874 |
| Bottom | 1.106 | 201] 1.5 [DL + LL] | 3202.8353 | 44.6495 | -67.4461 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3156.7801 | 76.6874 | -46.2186 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3202.8353 | -67.4461 | -46.2186 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.173 | 201] 1.5 [DL + LL] | 3432.9421 | -44.1454 | 73.8762 |
| Bottom | 1.183 | 201] 1.5 [DL + LL] | 3478.9973 | 43.9753 | -65.373 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3432.9421 | 73.8762 | -44.6746 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3478.9973 | -65.373 | -44.6746 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.252 | 201] 1.5 [DL + LL] | 3714.9632 | -43.3771 | 70.9837 |
| Bottom | 1.262 | 201] 1.5 [DL + LL] | 3761.0183 | 43.1722 | -63.0341 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3714.9632 | 70.9837 | -43.019 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3761.0183 | -63.0341 | -43.019 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.335 | 201] 1.5 [DL + LL] | 4003.2393 | -42.4786 | 68.0168 |
| Bottom | 1.35 | 201] 1.5 [DL + LL] | 4049.2944 | 42.2401 | -60.4903 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4003.2393 | 68.0168 | -41.2731 | 184.9763 | 410.1589 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4049.2944 | -60.4903 | -41.2731 | 184.9763 | 410.1589 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.429 | 201] 1.5 [DL + LL] | 4298.2144 | -41.4738 | 64.8798 |
| Bottom | 1.444 | 201] 1.5 [DL + LL] | 4344.2696 | 41.1601 | -57.4978 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4298.2144 | 64.8798 | -39.3289 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4344.2696 | -57.4978 | -39.3289 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.525 | 201] 1.5 [DL + LL] | 4600.3555 | -40.4731 | 61.7951 |
| Bottom | 1.541 | 201] 1.5 [DL + LL] | 4646.4106 | 40.3542 | -50.6061 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4600.3555 | 61.7951 | -36.1538 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4646.4106 | -50.6061 | -36.1538 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.621 | 201] 1.5 [DL + LL] | 4910.0424 | -38.5092 | 62.5031 |
| Bottom | 1.631 | 201] 1.5 [DL + LL] | 4956.0975 | 38.0665 | -103.7123 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4910.0424 | 62.5031 | -53.29 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4956.0975 | -103.7123 | -53.29 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.729 | 201] 1.5 [DL + LL] | 5228.7831 | -37.9661 | -1.4391 |
| Bottom | 1.748 | 201] 1.5 [DL + LL] | 5274.8383 | 37.9291 | 246.2255 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5228.7831 | -1.4391 | 78.1882 | 168.8595 | 394.0421 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5274.8383 | 246.2255 | 78.1882 | 168.8595 | 394.0421 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.457 | 201] 1.5 [DL + LL] | 5541.7284 | -59.3192 | -735.9971 |
| Bottom | 1.366 | 201] 1.5 [DL + LL] | 5601.9544 | 55.26 | 50.9279 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5541.7284 | -735.9971 | 249.5448 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5601.9544 | 50.9279 | 249.5448 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.417 | 201] 1.5 [DL + LL] | 5870.6766 | -45.9602 | 97.3472 |
| Bottom | 1.438 | 201] 1.5 [DL + LL] | 5930.9026 | 47.8467 | -2.6278 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5870.6766 | 97.3472 | -32.2812 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5930.9026 | -2.6278 | -32.2812 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.503 | 201] 1.5 [DL + LL] | 6208.0561 | -49.7112 | 37.8856 |
| Bottom | 1.518 | 201] 1.5 [DL + LL] | 6268.282 | 49.175 | -12.7919 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6208.0561 | 37.8856 | -16.4968 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6268.282 | -12.7919 | -16.4968 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.585 | 201] 1.5 [DL + LL] | 6554.8381 | -49.1287 | 18.975 |
| Bottom | 1.599 | 201] 1.5 [DL + LL] | 6615.0641 | 49.0718 | -5.5143 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6554.8381 | 18.975 | -8.1565 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6615.0641 | -5.5143 | -8.1565 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.668 | 201] 1.5 [DL + LL] | 6911.5011 | -48.832 | 16.4194 |
| Bottom | 1.683 | 201] 1.5 [DL + LL] | 6971.727 | 48.8227 | -0.0319 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6911.5011 | 16.4194 | -5.5733 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6971.727 | -0.0319 | -5.5733 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.754 | 201] 1.5 [DL + LL] | 7278.5674 | -48.5384 | 11.6246 |
| Bottom | 1.768 | 201] 1.5 [DL + LL] | 7338.7933 | 48.4584 | 5.9292 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7278.5674 | 11.6246 | -2.1166 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7338.7933 | 5.9292 | -2.1166 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.843 | 201] 1.5 [DL + LL] | 7656.7551 | -48.5261 | 6.6885 |
| Bottom | 1.857 | 201] 1.5 [DL + LL] | 7716.981 | 48.8827 | 14.4862 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7656.7551 | 6.6885 | 2.2222 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7716.981 | 14.4862 | 2.2222 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.933 | 201] 1.5 [DL + LL] | 8046.9034 | -47.0446 | 3.6515 |
| Bottom | 1.945 | 201] 1.5 [DL + LL] | 8107.1293 | 45.7952 | 13.9266 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8046.9034 | 3.6515 | 3.0828 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8107.1293 | 13.9266 | 3.0828 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.031 | 201] 1.5 [DL + LL] | 8449.2746 | -51.3114 | -9.2328 |
| Bottom | 2.053 | 201] 1.5 [DL + LL] | 8511.4125 | 58.7519 | 21.2094 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8449.2746 | -9.2328 | 9.2292 | 293.1677 | 587.6373 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8511.4125 | 21.2094 | 9.2292 | 293.1677 | 587.6373 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.45 | 201] 1.5 [DL + LL] | 8898.4663 | -242.3826 | -21.2167 |
| Bottom | 2.475 | 201] 1.5 [DL + LL] | 8978.7675 | 244.7434 | 33.0864 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8898.4663 | -21.2167 | 12.8174 | 216.648 | 511.1176 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 8978.7675 | 33.0864 | 12.8174 | 216.648 | 511.1176 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.575 | 201] 1.5 [DL + LL] | 9484.1597 | -243.9713 | -37.4831 |
| Bottom | 2.596 | 201] 1.5 [DL + LL] | 9561.0195 | 246.0414 | 37.6257 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9484.1597 | -37.4831 | 18.5771 | 226.3345 | 520.804 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 9561.0195 | 37.6257 | 18.5771 | 226.3345 | 520.804 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.982 | 201] 1.5 [DL + LL] | 1334.812 | 79.8819 | -173.6918 |
| Bottom | 0.766 | 201] 1.5 [DL + LL] | 1377.3245 | -70.4215 | -14.4484 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1334.812 | -173.6918 | 50.4226 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1377.3245 | -14.4484 | 50.4226 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.779 | 201] 1.5 [DL + LL] | 1600.0841 | 65.0052 | 17.8012 |
| Bottom | 0.793 | 201] 1.5 [DL + LL] | 1642.5966 | -66.0625 | -10.7191 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1600.0841 | 17.8012 | -9.3315 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1642.5966 | -10.7191 | -9.3315 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.858 | 201] 1.5 [DL + LL] | 1864.5334 | 65.8845 | 22.7734 |
| Bottom | 0.861 | 201] 1.5 [DL + LL] | 1907.0459 | -65.2285 | -14.2624 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1864.5334 | 22.7734 | -12.0529 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1907.0459 | -14.2624 | -12.0529 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.92 | 201] 1.5 [DL + LL] | 2127.8878 | 64.5243 | 19.7892 |
| Bottom | 0.925 | 201] 1.5 [DL + LL] | 2170.4002 | -63.9796 | -13.4912 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2127.8878 | 19.7892 | -10.8811 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2170.4002 | -13.4912 | -10.8811 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.987 | 201] 1.5 [DL + LL] | 2390.2086 | 63.6105 | 21.0187 |
| Bottom | 0.994 | 201] 1.5 [DL + LL] | 2432.721 | -62.9534 | -14.071 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2390.2086 | 21.0187 | -11.4697 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2432.721 | -14.071 | -11.4697 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.061 | 201] 1.5 [DL + LL] | 2651.4857 | 62.567 | 20.8648 |
| Bottom | 1.069 | 201] 1.5 [DL + LL] | 2693.9982 | -61.8896 | -14.641 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2651.4857 | 20.8648 | -11.6119 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2693.9982 | -14.641 | -11.6119 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.064 | 201] 1.5 [DL + LL] | 2911.6371 | 61.5452 | 20.5923 |
| Bottom | 1.071 | 201] 1.5 [DL + LL] | 2954.1495 | -60.8236 | -14.9753 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2911.6371 | 20.5923 | -11.64 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2954.1495 | -14.9753 | -11.64 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.133 | 201] 1.5 [DL + LL] | 3170.5795 | 60.507 | 20.4376 |
| Bottom | 1.14 | 201] 1.5 [DL + LL] | 3213.0919 | -59.7573 | -14.8695 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3170.5795 | 20.4376 | -11.5635 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3213.0919 | -14.8695 | -11.5635 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.25 | 201] 1.5 [DL + LL] | 3428.2277 | 59.3981 | 20.6521 |
| Bottom | 1.255 | 201] 1.5 [DL + LL] | 3470.7401 | -58.6302 | -13.1766 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3428.2277 | 20.6521 | -11.0928 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3470.7401 | -13.1766 | -11.0928 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.322 | 201] 1.5 [DL + LL] | 3684.5095 | 58.2113 | 22.5345 |
| Bottom | 1.331 | 201] 1.5 [DL + LL] | 3727.0219 | -57.2773 | -22.7897 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3684.5095 | 22.5345 | -14.7381 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3727.0219 | -22.7897 | -14.7381 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.34 | 201] 1.5 [DL + LL] | 3939.3228 | 57.4633 | 12.5705 |
| Bottom | 1.364 | 201] 1.5 [DL + LL] | 3981.8353 | -55.3197 | -57.2847 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3939.3228 | 12.5705 | -22.659 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3981.8353 | -57.2847 | -22.659 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.421 | 201] 1.5 [DL + LL] | 4190.8221 | 58.2683 | -27.0573 |
| Bottom | 1.517 | 201] 1.5 [DL + LL] | 4233.3346 | -62.8296 | 258.0592 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4190.8221 | -27.0573 | 90.1509 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4233.3346 | 258.0592 | 90.1509 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.445 | 201] 1.5 [DL + LL] | 4464.0179 | 110.7718 | -745.7355 |
| Bottom | 1.224 | 201] 1.5 [DL + LL] | 4524.2439 | -99.6367 | -44.0529 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4464.0179 | -745.7355 | 222.7511 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4524.2439 | -44.0529 | 222.7511 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.262 | 201] 1.5 [DL + LL] | 4747.2265 | 99.4384 | -9.3451 |
| Bottom | 1.278 | 201] 1.5 [DL + LL] | 4807.4524 | -98.114 | 38.5766 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4747.2265 | -9.3451 | 14.6436 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4807.4524 | 38.5766 | 14.6436 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.327 | 201] 1.5 [DL + LL] | 5030.0577 | 95.8817 | 76.3692 |
| Bottom | 1.318 | 201] 1.5 [DL + LL] | 5090.2836 | -94.5478 | -5.9459 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5030.0577 | 76.3692 | -26.5169 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5090.2836 | -5.9459 | -26.5169 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.368 | 201] 1.5 [DL + LL] | 5311.1557 | 92.7265 | 35.3596 |
| Bottom | 1.37 | 201] 1.5 [DL + LL] | 5371.3816 | -90.9889 | -16.1892 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5311.1557 | 35.3596 | -16.6678 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5371.3816 | -16.1892 | -16.6678 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.415 | 201] 1.5 [DL + LL] | 5589.8726 | 89.8431 | 26.6974 |
| Bottom | 1.418 | 201] 1.5 [DL + LL] | 5650.0985 | -87.8416 | -14.455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5589.8726 | 26.6974 | -13.3482 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5650.0985 | -14.455 | -13.3482 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.464 | 201] 1.5 [DL + LL] | 5866.1174 | 86.4175 | 29.9772 |
| Bottom | 1.472 | 201] 1.5 [DL + LL] | 5926.3433 | -84.2755 | -13.1574 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5866.1174 | 29.9772 | -13.9494 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5926.3433 | -13.1574 | -13.9494 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.52 | 201] 1.5 [DL + LL] | 6139.8222 | 82.9786 | 33.1906 |
| Bottom | 1.533 | 201] 1.5 [DL + LL] | 6200.0481 | -80.9811 | -15.0049 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6139.8222 | 33.1906 | -15.5118 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6200.0481 | -15.0049 | -15.5118 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.579 | 201] 1.5 [DL + LL] | 6410.9156 | 78.5722 | 33.5269 |
| Bottom | 1.59 | 201] 1.5 [DL + LL] | 6471.1416 | -74.3142 | -9.6783 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6410.9156 | 33.5269 | -13.8746 | 307.0552 | 601.5247 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6471.1416 | -9.6783 | -13.8746 | 307.0552 | 601.5247 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.643 | 201] 1.5 [DL + LL] | 6679.4645 | 79.24 | 41.1917 |
| Bottom | 1.671 | 201] 1.5 [DL + LL] | 6741.6024 | -88.6726 | 86.7642 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6679.4645 | 41.1917 | 14.0687 | 293.1677 | 587.6373 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6741.6024 | 86.7642 | 14.0687 | 293.1677 | 587.6373 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.012 | 201] 1.5 [DL + LL] | 7168.3776 | 178.2718 | -160.5292 |
| Bottom | 2.033 | 201] 1.5 [DL + LL] | 7248.6789 | -180.6327 | 149.4508 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7168.3776 | -160.5292 | 73.8215 | 216.648 | 511.1176 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7248.6789 | 149.4508 | 73.8215 | 216.648 | 511.1176 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.278 | 201] 1.5 [DL + LL] | 7681.6104 | 229.9833 | -115.6239 |
| Bottom | 2.282 | 201] 1.5 [DL + LL] | 7758.4702 | -232.0535 | 59.4419 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7681.6104 | -115.6239 | 43.5344 | 226.3345 | 520.804 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7758.4702 | 59.4419 | 43.5344 | 226.3345 | 520.804 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.251 | 201] 1.5 [DL + LL] | 1420.1143 | -100.7352 | -250.4674 |
| Bottom | 0.926 | 201] 1.5 [DL + LL] | 1462.6267 | 86.7344 | 50.0433 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1420.1143 | -250.4674 | 95.1641 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1462.6267 | 50.0433 | 95.1641 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.859 | 201] 1.5 [DL + LL] | 1699.1912 | -76.0023 | -3.4614 |
| Bottom | 0.907 | 201] 1.5 [DL + LL] | 1741.7037 | 78.7639 | 28.509 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1699.1912 | -3.4614 | 9.7902 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1741.7037 | 28.509 | 9.7902 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.964 | 201] 1.5 [DL + LL] | 1975.6903 | -80.4562 | -23.7439 |
| Bottom | 0.976 | 201] 1.5 [DL + LL] | 2018.2028 | 79.9239 | 31.073 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1975.6903 | -23.7439 | 17.0224 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2018.2028 | 31.073 | 17.0224 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.032 | 201] 1.5 [DL + LL] | 2251.8224 | -79.5597 | -21.2443 |
| Bottom | 1.049 | 201] 1.5 [DL + LL] | 2294.3348 | 79.5677 | 30.6134 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2251.8224 | -21.2443 | 16.0616 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2294.3348 | 30.6134 | 16.0616 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.08 | 201] 1.5 [DL + LL] | 2527.76 | -79.8081 | -21.3266 |
| Bottom | 1.095 | 201] 1.5 [DL + LL] | 2570.2725 | 79.7077 | 29.6613 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2527.76 | -21.3266 | 15.7723 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2570.2725 | 29.6613 | 15.7723 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.152 | 201] 1.5 [DL + LL] | 2803.6869 | -79.8551 | -21.8896 |
| Bottom | 1.168 | 201] 1.5 [DL + LL] | 2846.1994 | 79.8247 | 28.9824 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2803.6869 | -21.8896 | 15.7243 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2846.1994 | 28.9824 | 15.7243 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 201] 1.5 [DL + LL] | 3079.7687 | -80.0284 | -22.2053 |
| Bottom | 1.228 | 201] 1.5 [DL + LL] | 3122.2812 | 80.0196 | 28.6142 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3079.7687 | -22.2053 | 15.6984 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3122.2812 | 28.6142 | 15.6984 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.296 | 201] 1.5 [DL + LL] | 3356.1887 | -80.277 | -22.1496 |
| Bottom | 1.31 | 201] 1.5 [DL + LL] | 3398.7011 | 80.2726 | 28.6413 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3356.1887 | -22.1496 | 15.6842 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3398.7011 | 28.6413 | 15.6842 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.34 | 201] 1.5 [DL + LL] | 3633.1405 | -80.638 | -21.5098 |
| Bottom | 1.355 | 201] 1.5 [DL + LL] | 3675.653 | 80.6954 | 28.928 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3633.1405 | -21.5098 | 15.5756 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3675.653 | 28.928 | 15.5756 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.419 | 201] 1.5 [DL + LL] | 3910.7689 | -80.9402 | -20.2586 |
| Bottom | 1.434 | 201] 1.5 [DL + LL] | 3953.2813 | 80.6164 | 29.1214 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3910.7689 | -20.2586 | 15.2571 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3953.2813 | 29.1214 | 15.2571 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.503 | 201] 1.5 [DL + LL] | 4189.4575 | -82.3368 | -18.9315 |
| Bottom | 1.519 | 201] 1.5 [DL + LL] | 4231.9699 | 82.9393 | -21.9196 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4189.4575 | -18.9315 | -1.4314 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4231.9699 | -21.9196 | -1.4314 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.6 | 201] 1.5 [DL + LL] | 4471.0952 | -80.7421 | -75.2073 |
| Bottom | 1.674 | 201] 1.5 [DL + LL] | 4513.6077 | 77.944 | 294.7674 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4471.0952 | -75.2073 | 117.052 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4513.6077 | 294.7674 | 117.052 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.413 | 201] 1.5 [DL + LL] | 4710.5191 | -82.793 | -1123.8599 |
| Bottom | 1.168 | 201] 1.5 [DL + LL] | 4774.2878 | 78.9993 | 88.0506 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4710.5191 | -1123.8599 | 384.6909 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4774.2878 | 88.0506 | 384.6909 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.197 | 201] 1.5 [DL + LL] | 4974.4065 | -80.8896 | -21.2165 |
| Bottom | 1.223 | 201] 1.5 [DL + LL] | 5038.1752 | 79.2617 | 92.3154 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4974.4065 | -21.2165 | 35.5544 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5038.1752 | 92.3154 | 35.5544 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.237 | 201] 1.5 [DL + LL] | 5236.9486 | -77.3345 | -8.7266 |
| Bottom | 1.261 | 201] 1.5 [DL + LL] | 5300.7172 | 76.9119 | 56.3446 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5236.9486 | -8.7266 | 20.3174 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5300.7172 | 56.3446 | 20.3174 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.292 | 201] 1.5 [DL + LL] | 5498.0151 | -75.327 | -38.1656 |
| Bottom | 1.306 | 201] 1.5 [DL + LL] | 5561.7838 | 74.6491 | 51.0393 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5498.0151 | -38.1656 | 28.023 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5561.7838 | 51.0393 | 28.023 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.348 | 201] 1.5 [DL + LL] | 5758.1853 | -73.3763 | -39.163 |
| Bottom | 1.361 | 201] 1.5 [DL + LL] | 5821.954 | 72.4452 | 51.3332 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5758.1853 | -39.163 | 28.4507 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5821.954 | 51.3332 | 28.4507 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.404 | 201] 1.5 [DL + LL] | 6017.3739 | -71.3402 | -34.5096 |
| Bottom | 1.417 | 201] 1.5 [DL + LL] | 6081.1426 | 70.5164 | 51.7877 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6017.3739 | -34.5096 | 27.1483 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6081.1426 | 51.7877 | 27.1483 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.459 | 201] 1.5 [DL + LL] | 6275.4208 | -68.7167 | -29.0849 |
| Bottom | 1.471 | 201] 1.5 [DL + LL] | 6339.1895 | 66.7773 | 52.2743 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6275.4208 | -29.0849 | 25.6313 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6339.1895 | 52.2743 | 25.6313 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.517 | 201] 1.5 [DL + LL] | 6532.4772 | -68.4594 | -23.0502 |
| Bottom | 1.531 | 201] 1.5 [DL + LL] | 6596.2458 | 70.1744 | 49.8947 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6532.4772 | -23.0502 | 23.0326 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6596.2458 | 49.8947 | 23.0326 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.564 | 201] 1.5 [DL + LL] | 6787.6126 | -58.069 | -19.6306 |
| Bottom | 1.566 | 201] 1.5 [DL + LL] | 6853.4056 | 44.897 | 25.747 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6787.6126 | -19.6306 | 13.9048 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6853.4056 | 25.747 | 13.9048 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.075 | 201] 1.5 [DL + LL] | 7043.4949 | -260.2157 | -38.2248 |
| Bottom | 2.098 | 201] 1.5 [DL + LL] | 7128.5198 | 262.7154 | 41.123 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7043.4949 | -38.2248 | 18.8127 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7128.5198 | 41.123 | 18.8127 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.849 | 201] 1.5 [DL + LL] | 7585.1771 | -151.3432 | -52.3474 |
| Bottom | 1.87 | 201] 1.5 [DL + LL] | 7666.558 | 153.5351 | 52.4972 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7585.1771 | -52.3474 | 25.9788 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7666.558 | 52.4972 | 25.9788 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.231 | 201] 1.5 [DL + LL] | 1399.6994 | 99.4569 | -244.3391 |
| Bottom | 0.911 | 201] 1.5 [DL + LL] | 1442.2118 | -86.1517 | 42.4717 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1399.6994 | -244.3391 | 90.9016 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1442.2118 | 42.4717 | 90.9016 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.854 | 201] 1.5 [DL + LL] | 1679.0066 | 75.3495 | -6.9703 |
| Bottom | 0.895 | 201] 1.5 [DL + LL] | 1721.519 | -78.1178 | 24.0326 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1679.0066 | -6.9703 | 9.5691 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1721.519 | 24.0326 | 9.5691 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.954 | 201] 1.5 [DL + LL] | 1955.5458 | 79.3941 | -25.3127 |
| Bottom | 0.964 | 201] 1.5 [DL + LL] | 1998.0583 | -78.9193 | 28.1876 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1955.5458 | -25.3127 | 16.6845 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1998.0583 | 28.1876 | 16.6845 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.021 | 201] 1.5 [DL + LL] | 2231.5213 | 78.4555 | -21.8335 |
| Bottom | 1.036 | 201] 1.5 [DL + LL] | 2274.0337 | -78.3945 | 28.551 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2231.5213 | -21.8335 | 15.6723 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2274.0337 | 28.551 | 15.6723 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.068 | 201] 1.5 [DL + LL] | 2507.1536 | 78.6005 | -21.395 |
| Bottom | 1.082 | 201] 1.5 [DL + LL] | 2549.6661 | -78.3926 | 27.9961 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2507.1536 | -21.395 | 15.3442 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2549.6661 | 27.9961 | 15.3442 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.14 | 201] 1.5 [DL + LL] | 2782.6541 | 78.571 | -21.7157 |
| Bottom | 1.154 | 201] 1.5 [DL + LL] | 2825.1666 | -78.4031 | 27.4619 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2782.6541 | -21.7157 | 15.2668 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2825.1666 | 27.4619 | 15.2668 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.202 | 201] 1.5 [DL + LL] | 3058.2057 | 78.6685 | -21.9825 |
| Bottom | 1.216 | 201] 1.5 [DL + LL] | 3100.7181 | -78.5074 | 27.0865 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3058.2057 | -21.9825 | 15.2243 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3100.7181 | 27.0865 | 15.2243 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.284 | 201] 1.5 [DL + LL] | 3334.0025 | 78.8435 | -22.0281 |
| Bottom | 1.297 | 201] 1.5 [DL + LL] | 3376.5149 | -78.6861 | 26.9857 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3334.0025 | -22.0281 | 15.2013 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3376.5149 | 26.9857 | 15.2013 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.328 | 201] 1.5 [DL + LL] | 3610.243 | 79.1161 | -21.6532 |
| Bottom | 1.342 | 201] 1.5 [DL + LL] | 3652.7555 | -79.0168 | 26.9818 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3610.243 | -21.6532 | 15.0808 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3652.7555 | 26.9818 | 15.0808 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 201] 1.5 [DL + LL] | 3887.0724 | 79.345 | -20.9284 |
| Bottom | 1.42 | 201] 1.5 [DL + LL] | 3929.5848 | -78.947 | 26.83 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3887.0724 | -20.9284 | 14.8101 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3929.5848 | 26.83 | 14.8101 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.49 | 201] 1.5 [DL + LL] | 4164.8654 | 80.498 | -20.3234 |
| Bottom | 1.505 | 201] 1.5 [DL + LL] | 4207.3778 | -80.8178 | -25.5134 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4164.8654 | -20.3234 | -2.0824 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4207.3778 | -25.5134 | -2.0824 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.588 | 201] 1.5 [DL + LL] | 4445.4433 | 79.2749 | -78.6591 |
| Bottom | 1.664 | 201] 1.5 [DL + LL] | 4487.9557 | -77.5153 | 289.8882 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4445.4433 | -78.6591 | 116.6022 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4487.9557 | 289.8882 | 116.6022 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 201] 1.5 [DL + LL] | 4685.0565 | 82.2689 | -1124.0202 |
| Bottom | 1.163 | 201] 1.5 [DL + LL] | 4748.8252 | -78.1037 | 96.6884 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4685.0565 | -1124.0202 | 387.4447 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4748.8252 | 96.6884 | 387.4447 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.19 | 201] 1.5 [DL + LL] | 4948.5253 | 80.7388 | -16.611 |
| Bottom | 1.217 | 201] 1.5 [DL + LL] | 5012.294 | -78.4697 | 97.1023 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4948.5253 | -16.611 | 35.597 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5012.294 | 97.1023 | 35.597 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.231 | 201] 1.5 [DL + LL] | 5210.6611 | 76.826 | -6.7948 |
| Bottom | 1.254 | 201] 1.5 [DL + LL] | 5274.4297 | -75.9368 | 59.0415 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5210.6611 | -6.7948 | 20.5598 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5274.4297 | 59.0415 | 20.5598 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.286 | 201] 1.5 [DL + LL] | 5471.2212 | 74.5643 | -37.6037 |
| Bottom | 1.298 | 201] 1.5 [DL + LL] | 5534.9899 | -73.4459 | 52.7588 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5471.2212 | -37.6037 | 28.3977 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5534.9899 | 52.7588 | 28.3977 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.341 | 201] 1.5 [DL + LL] | 5730.746 | 72.3944 | -39.0887 |
| Bottom | 1.354 | 201] 1.5 [DL + LL] | 5794.5147 | -71.0673 | 52.4239 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5730.746 | -39.0887 | 28.7851 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5794.5147 | 52.4239 | 28.7851 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.397 | 201] 1.5 [DL + LL] | 5989.1216 | 70.0486 | -34.667 |
| Bottom | 1.409 | 201] 1.5 [DL + LL] | 6052.8903 | -68.718 | 52.3778 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5989.1216 | -34.667 | 27.3996 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6052.8903 | 52.3778 | 27.3996 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.452 | 201] 1.5 [DL + LL] | 6246.1907 | 67.4217 | -29.4054 |
| Bottom | 1.463 | 201] 1.5 [DL + LL] | 6309.9594 | -65.5511 | 52.6169 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6246.1907 | -29.4054 | 25.8565 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6309.9594 | 52.6169 | 25.8565 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.507 | 201] 1.5 [DL + LL] | 6501.9933 | 65.7515 | -23.2789 |
| Bottom | 1.52 | 201] 1.5 [DL + LL] | 6565.762 | -64.8837 | 49.7636 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6501.9933 | -23.2789 | 23.0781 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6565.762 | 49.7636 | 23.0781 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.559 | 201] 1.5 [DL + LL] | 6756.1232 | 60.4271 | -20.1464 |
| Bottom | 1.569 | 201] 1.5 [DL + LL] | 6821.9163 | -56.3692 | 27.9466 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6756.1232 | -20.1464 | 14.7547 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6821.9163 | 27.9466 | 14.7547 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.794 | 201] 1.5 [DL + LL] | 7008.5806 | 174.0723 | -35.7245 |
| Bottom | 1.817 | 201] 1.5 [DL + LL] | 7093.6055 | -176.572 | 33.76 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7008.5806 | -35.7245 | 16.482 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7093.6055 | 33.76 | 16.482 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.011 | 201] 1.5 [DL + LL] | 7349.1827 | 226.4285 | -38.4115 |
| Bottom | 2.032 | 201] 1.5 [DL + LL] | 7430.5637 | -228.6204 | 38.9611 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7349.1827 | -38.4115 | 19.1724 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7430.5637 | 38.9611 | 19.1724 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.732 | 201] 1.5 [DL + LL] | 1747.3997 | -23.8062 | 240.556 |
| Bottom | 0.639 | 201] 1.5 [DL + LL] | 1789.9121 | 20.3431 | 5.58 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1747.3997 | 240.556 | -74.9852 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1789.9121 | 5.58 | -74.9852 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.705 | 201] 1.5 [DL + LL] | 1965.9378 | -18.5626 | -77.6655 |
| Bottom | 0.716 | 201] 1.5 [DL + LL] | 2008.4503 | 19.8097 | 45.1139 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1965.9378 | -77.6655 | 38.6196 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2008.4503 | 45.1139 | 38.6196 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.772 | 201] 1.5 [DL + LL] | 2186.2079 | -20.0985 | -41.1949 |
| Bottom | 0.789 | 201] 1.5 [DL + LL] | 2228.7203 | 20.3358 | 48.6659 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2186.2079 | -41.1949 | 28.1102 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2228.7203 | 48.6659 | 28.1102 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.847 | 201] 1.5 [DL + LL] | 2407.5916 | -21.3705 | -37.7401 |
| Bottom | 0.862 | 201] 1.5 [DL + LL] | 2450.1041 | 21.3325 | 47.5592 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2407.5916 | -37.7401 | 26.6565 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2450.1041 | 47.5592 | 26.6565 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.925 | 201] 1.5 [DL + LL] | 2629.8868 | -22.2648 | -38.4587 |
| Bottom | 0.938 | 201] 1.5 [DL + LL] | 2672.3993 | 22.1968 | 46.5703 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2629.8868 | -38.4587 | 26.5695 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2672.3993 | 46.5703 | 26.5695 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.002 | 201] 1.5 [DL + LL] | 2852.8413 | -22.9802 | -38.9554 |
| Bottom | 1.015 | 201] 1.5 [DL + LL] | 2895.3537 | 22.8903 | 45.7817 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2852.8413 | -38.9554 | 26.4754 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2895.3537 | 45.7817 | 26.4754 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.015 | 201] 1.5 [DL + LL] | 3076.2084 | -23.5601 | -39.1335 |
| Bottom | 1.028 | 201] 1.5 [DL + LL] | 3118.7209 | 23.4261 | 45.2499 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3076.2084 | -39.1335 | 26.3622 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3118.7209 | 45.2499 | 26.3622 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.087 | 201] 1.5 [DL + LL] | 3299.7334 | -24.0276 | -38.8767 |
| Bottom | 1.1 | 201] 1.5 [DL + LL] | 3342.2458 | 23.8107 | 45.124 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3299.7334 | -38.8767 | 26.2431 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3342.2458 | 45.124 | 26.2431 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.19 | 201] 1.5 [DL + LL] | 3523.1445 | -24.4231 | -37.9498 |
| Bottom | 1.203 | 201] 1.5 [DL + LL] | 3565.6569 | 24.1909 | 44.4211 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3523.1445 | -37.9498 | 25.7349 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3565.6569 | 44.4211 | 25.7349 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.264 | 201] 1.5 [DL + LL] | 3746.1437 | -24.5438 | -37.3165 |
| Bottom | 1.276 | 201] 1.5 [DL + LL] | 3788.6561 | 23.8317 | 41.8056 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3746.1437 | -37.3165 | 24.7145 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3788.6561 | 41.8056 | 24.7145 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.119 | 201] 1.5 [DL + LL] | 3968.5769 | -25.5889 | -38.3779 |
| Bottom | 1.124 | 201] 1.5 [DL + LL] | 4011.0893 | 24.3898 | 85.8504 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3968.5769 | -38.3779 | 39.1149 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4011.0893 | 85.8504 | 39.1149 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.184 | 201] 1.5 [DL + LL] | 4190.9728 | -26.8002 | 9.6903 |
| Bottom | 1.208 | 201] 1.5 [DL + LL] | 4233.4853 | 30.6285 | -224.4423 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4190.9728 | 9.6903 | -74.765 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4233.4853 | -224.4423 | -74.765 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.317 | 201] 1.5 [DL + LL] | 4425.2718 | -84.6646 | 944.9877 |
| Bottom | 1.088 | 201] 1.5 [DL + LL] | 4489.0405 | 73.8474 | 41.8338 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4425.2718 | 944.9877 | -287.3507 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4489.0405 | 41.8338 | -287.3507 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.148 | 201] 1.5 [DL + LL] | 4699.0257 | -78.6254 | -67.0645 |
| Bottom | 1.149 | 201] 1.5 [DL + LL] | 4762.7943 | 76.9466 | 34.7655 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4699.0257 | -67.0645 | 32.1146 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4762.7943 | 34.7655 | 32.1146 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.192 | 201] 1.5 [DL + LL] | 4970.1047 | -74.1787 | -71.0162 |
| Bottom | 1.202 | 201] 1.5 [DL + LL] | 5033.8734 | 74.1901 | 58.7638 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4970.1047 | -71.0162 | 40.9137 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5033.8734 | 58.7638 | 40.9137 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.237 | 201] 1.5 [DL + LL] | 5237.9625 | -73.4322 | -44.3168 |
| Bottom | 1.251 | 201] 1.5 [DL + LL] | 5301.7312 | 72.7083 | 56.6658 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5237.9625 | -44.3168 | 31.7766 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5301.7312 | 56.6658 | 31.7766 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.29 | 201] 1.5 [DL + LL] | 5503.1361 | -72.383 | -43.3064 |
| Bottom | 1.303 | 201] 1.5 [DL + LL] | 5566.9047 | 71.4446 | 55.9901 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5503.1361 | -43.3064 | 31.2631 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5566.9047 | 55.9901 | 31.2631 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.348 | 201] 1.5 [DL + LL] | 5765.69 | -71.2402 | -40.8469 |
| Bottom | 1.36 | 201] 1.5 [DL + LL] | 5829.4587 | 70.1028 | 57.3954 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5765.69 | -40.8469 | 30.9592 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5829.4587 | 57.3954 | 30.9592 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.405 | 201] 1.5 [DL + LL] | 6025.4968 | -70.2168 | -36.054 |
| Bottom | 1.417 | 201] 1.5 [DL + LL] | 6089.2655 | 69.025 | 58.8825 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6025.4968 | -36.054 | 29.9602 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6089.2655 | 58.8825 | 29.9602 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.461 | 201] 1.5 [DL + LL] | 6282.3473 | -68.7556 | -30.7919 |
| Bottom | 1.472 | 201] 1.5 [DL + LL] | 6346.1159 | 66.3483 | 52.4439 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6282.3473 | -30.7919 | 26.315 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6346.1159 | 52.4439 | 26.315 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.518 | 201] 1.5 [DL + LL] | 6536.3137 | -69.8965 | -33.646 |
| Bottom | 1.538 | 201] 1.5 [DL + LL] | 6602.1067 | 75.0829 | 30.1317 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6536.3137 | -33.646 | 19.5558 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6602.1067 | 30.1317 | 19.5558 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.934 | 201] 1.5 [DL + LL] | 6814.962 | -230.0442 | -38.1284 |
| Bottom | 1.951 | 201] 1.5 [DL + LL] | 6899.9869 | 232.544 | 16.6283 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6814.962 | -38.1284 | 12.9233 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6899.9869 | 16.6283 | 12.9233 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.82 | 201] 1.5 [DL + LL] | 7176.6349 | -170.501 | -51.2177 |
| Bottom | 1.846 | 201] 1.5 [DL + LL] | 7258.0159 | 172.6929 | 77.5393 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7176.6349 | -51.2177 | 31.8549 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7258.0159 | 77.5393 | 31.8549 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.841 | 201] 1.5 [DL + LL] | 878.1951 | -129.5288 | 57.2305 |
| Bottom | 1.31 | 201] 1.5 [DL + LL] | 920.7075 | 109.9484 | 26.9615 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 878.1951 | 57.2305 | -9.5659 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 920.7075 | 26.9615 | -9.5659 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.995 | 201] 1.5 [DL + LL] | 1192.5373 | -94.3211 | -62.8516 |
| Bottom | 1.01 | 201] 1.5 [DL + LL] | 1235.0498 | 98.0716 | 41.8953 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1192.5373 | -62.8516 | 33.3145 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1235.0498 | 41.8953 | 33.3145 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.063 | 201] 1.5 [DL + LL] | 1502.5111 | -99.4978 | -50.1639 |
| Bottom | 1.058 | 201] 1.5 [DL + LL] | 1545.0235 | 98.9832 | 46.6164 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1502.5111 | -50.1639 | 30.7773 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1545.0235 | 46.6164 | 30.7773 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.078 | 201] 1.5 [DL + LL] | 1810.2185 | -97.268 | -45.0765 |
| Bottom | 1.09 | 201] 1.5 [DL + LL] | 1852.731 | 97.6675 | 45.8231 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1810.2185 | -45.0765 | 28.9215 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1852.731 | 45.8231 | 28.9215 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.117 | 201] 1.5 [DL + LL] | 2116.0612 | -96.7365 | -44.6128 |
| Bottom | 1.128 | 201] 1.5 [DL + LL] | 2158.5737 | 96.9975 | 44.5491 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2116.0612 | -44.6128 | 28.3841 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2158.5737 | 44.5491 | 28.3841 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.176 | 201] 1.5 [DL + LL] | 2420.725 | -96.1722 | -44.4438 |
| Bottom | 1.189 | 201] 1.5 [DL + LL] | 2463.2375 | 96.4774 | 43.4021 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2420.725 | -44.4438 | 27.9781 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2463.2375 | 43.4021 | 27.9781 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.221 | 201] 1.5 [DL + LL] | 2724.8236 | -95.8691 | -43.9737 |
| Bottom | 1.233 | 201] 1.5 [DL + LL] | 2767.3361 | 96.2083 | 42.4886 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2724.8236 | -43.9737 | 27.5481 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2767.3361 | 42.4886 | 27.5481 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.3 | 201] 1.5 [DL + LL] | 3028.9728 | -95.7349 | -43.0311 |
| Bottom | 1.312 | 201] 1.5 [DL + LL] | 3071.4853 | 96.1069 | 41.5616 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3028.9728 | -43.0311 | 26.9632 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3071.4853 | 41.5616 | 26.9632 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.328 | 201] 1.5 [DL + LL] | 3333.8016 | -95.8573 | -41.7835 |
| Bottom | 1.341 | 201] 1.5 [DL + LL] | 3376.314 | 96.4273 | 40.4233 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3333.8016 | -41.7835 | 26.215 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3376.314 | 40.4233 | 26.215 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.405 | 201] 1.5 [DL + LL] | 3639.8671 | -95.793 | -40.471 |
| Bottom | 1.418 | 201] 1.5 [DL + LL] | 3682.3795 | 95.8321 | 42.2724 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3639.8671 | -40.471 | 26.4006 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3682.3795 | 42.2724 | 26.4006 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.439 | 201] 1.5 [DL + LL] | 3948.183 | -97.7404 | -35.2119 |
| Bottom | 1.475 | 201] 1.5 [DL + LL] | 3990.6955 | 100.2769 | 81.6241 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3948.183 | -35.2119 | 37.3449 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3990.6955 | 81.6241 | 37.3449 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.495 | 201] 1.5 [DL + LL] | 4258.0943 | -92.3549 | 11.9371 |
| Bottom | 1.562 | 201] 1.5 [DL + LL] | 4300.6068 | 83.7167 | -259.3691 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4258.0943 | 11.9371 | -86.0247 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4300.6068 | -259.3691 | -86.0247 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.335 | 201] 1.5 [DL + LL] | 4528.7912 | -82.3698 | 982.0036 |
| Bottom | 1.125 | 201] 1.5 [DL + LL] | 4592.5599 | 78.2393 | 64.1288 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4528.7912 | 982.0036 | -291.7458 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4592.5599 | 64.1288 | -291.7458 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.163 | 201] 1.5 [DL + LL] | 4808.573 | -78.6739 | 37.39 |
| Bottom | 1.173 | 201] 1.5 [DL + LL] | 4872.3417 | 78.8301 | -27.3945 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4808.573 | 37.39 | -20.2751 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4872.3417 | -27.3945 | -20.2751 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.219 | 201] 1.5 [DL + LL] | 5092.8917 | -77.186 | -49.5442 |
| Bottom | 1.22 | 201] 1.5 [DL + LL] | 5156.6604 | 77.4623 | -4.624 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5092.8917 | -49.5442 | 14.4604 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5156.6604 | -4.624 | 14.4604 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.268 | 201] 1.5 [DL + LL] | 5379.7258 | -76.5782 | -26.3209 |
| Bottom | 1.283 | 201] 1.5 [DL + LL] | 5443.4945 | 76.7184 | 3.3564 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5379.7258 | -26.3209 | 9.5521 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5443.4945 | 3.3564 | 9.5521 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.332 | 201] 1.5 [DL + LL] | 5669.5637 | -75.8644 | -15.8316 |
| Bottom | 1.347 | 201] 1.5 [DL + LL] | 5733.3324 | 76.0026 | 4.2725 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5669.5637 | -15.8316 | 6.487 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5733.3324 | 4.2725 | 6.487 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.397 | 201] 1.5 [DL + LL] | 5962.6208 | -75.1908 | -11.7729 |
| Bottom | 1.411 | 201] 1.5 [DL + LL] | 6026.3895 | 75.4587 | 5.3322 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5962.6208 | -11.7729 | 5.524 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6026.3895 | 5.3322 | 5.524 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.462 | 201] 1.5 [DL + LL] | 6259.3367 | -74.4156 | -6.9352 |
| Bottom | 1.476 | 201] 1.5 [DL + LL] | 6323.1054 | 74.5102 | 9.5834 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6259.3367 | -6.9352 | 5.3444 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6323.1054 | 9.5834 | 5.3444 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.529 | 201] 1.5 [DL + LL] | 6559.1933 | -73.9532 | 0.8737 |
| Bottom | 1.544 | 201] 1.5 [DL + LL] | 6622.9619 | 75.4836 | -11.0948 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6559.1933 | 0.8737 | -3.6773 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6622.9619 | -11.0948 | -3.6773 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.595 | 201] 1.5 [DL + LL] | 6867.4873 | -72.2965 | -11.3447 |
| Bottom | 1.609 | 201] 1.5 [DL + LL] | 6933.2804 | 71.5512 | 11.2253 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6867.4873 | -11.3447 | 7.0436 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6933.2804 | 11.2253 | 7.0436 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.073 | 201] 1.5 [DL + LL] | 7163.1938 | -252.5028 | -55.7871 |
| Bottom | 2.105 | 201] 1.5 [DL + LL] | 7248.2187 | 255.0025 | 92.2804 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7163.1938 | -55.7871 | 35.3303 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7248.2187 | 92.2804 | 35.3303 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.904 | 201] 1.5 [DL + LL] | 7608.0355 | -168.2226 | -92.1426 |
| Bottom | 1.912 | 201] 1.5 [DL + LL] | 7689.4164 | 170.4146 | 23.1932 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7608.0355 | -92.1426 | 28.7409 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7689.4164 | 23.1932 | 28.7409 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.624 | 201] 1.5 [DL + LL] | 1366.6541 | 30.7087 | 175.2019 |
| Bottom | 0.553 | 201] 1.5 [DL + LL] | 1409.1665 | -29.0261 | 29.8911 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1366.6541 | 175.2019 | -46.472 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1409.1665 | 29.8911 | -46.472 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.608 | 201] 1.5 [DL + LL] | 1554.9196 | 30.5791 | -44.3199 |
| Bottom | 0.62 | 201] 1.5 [DL + LL] | 1597.432 | -30.4754 | 39.031 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1554.9196 | -44.3199 | 26.1847 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1597.432 | 39.031 | 26.1847 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.671 | 201] 1.5 [DL + LL] | 1746.1553 | 31.8965 | -35.9675 |
| Bottom | 0.685 | 201] 1.5 [DL + LL] | 1788.6677 | -31.7248 | 41.7044 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1746.1553 | -35.9675 | 24.3527 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1788.6677 | 41.7044 | 24.3527 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.731 | 201] 1.5 [DL + LL] | 1938.9205 | 32.1384 | -33.5302 |
| Bottom | 0.747 | 201] 1.5 [DL + LL] | 1981.433 | -32.1081 | 41.4811 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1938.9205 | -33.5302 | 23.4975 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1981.433 | 41.4811 | 23.4975 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 900 | 0.0025 | 0.0031 | 201] 1.5 [DL + LL] | 2132.6729 | 32.3964 | -34.1458 | 360000 |
| Bottom | 900 | 0.0025 | 0.0031 | 201] 1.5 [DL + LL] | 2175.1854 | -32.2175 | 41.2463 | 360000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2132.6729 | -34.1458 | 23.6124 | 158.3508 | 366.2117 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2175.1854 | 41.2463 | 23.6124 | 158.3508 | 366.2117 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.854 | 201] 1.5 [DL + LL] | 2327.0717 | 32.4157 | -34.9659 |
| Bottom | 0.869 | 201] 1.5 [DL + LL] | 2369.5841 | -32.0915 | 41.3147 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2327.0717 | -34.9659 | 23.8899 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2369.5841 | 41.3147 | 23.8899 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.914 | 201] 1.5 [DL + LL] | 2521.7986 | 32.1765 | -35.6788 |
| Bottom | 0.929 | 201] 1.5 [DL + LL] | 2564.311 | -31.725 | 41.5948 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2521.7986 | -35.6788 | 24.2022 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2564.311 | 41.5948 | 24.2022 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.974 | 201] 1.5 [DL + LL] | 2716.5185 | 31.6617 | -36.3698 |
| Bottom | 0.988 | 201] 1.5 [DL + LL] | 2759.031 | -31.1326 | 42.0764 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2716.5185 | -36.3698 | 24.5738 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2759.031 | 42.0764 | 24.5738 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.033 | 201] 1.5 [DL + LL] | 2910.8674 | 30.7982 | -37.0543 |
| Bottom | 1.046 | 201] 1.5 [DL + LL] | 2953.3798 | -30.0725 | 41.8927 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2910.8674 | -37.0543 | 24.734 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2953.3798 | 41.8927 | 24.734 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.098 | 201] 1.5 [DL + LL] | 3104.5357 | 29.9244 | -38.6323 |
| Bottom | 1.111 | 201] 1.5 [DL + LL] | 3147.0482 | -29.8287 | 42.881 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3104.5357 | -38.6323 | 25.5478 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3147.0482 | 42.881 | 25.5478 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.935 | 201] 1.5 [DL + LL] | 3296.7898 | 26.8873 | -39.4208 |
| Bottom | 0.941 | 201] 1.5 [DL + LL] | 3339.3023 | -24.8011 | 86.4033 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3296.7898 | -39.4208 | 39.6805 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3339.3023 | 86.4033 | 39.6805 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.994 | 201] 1.5 [DL + LL] | 3486.7403 | 29.407 | 4.6105 |
| Bottom | 1.026 | 201] 1.5 [DL + LL] | 3529.2528 | -32.6344 | -194.6318 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3486.7403 | 4.6105 | -63.5791 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3529.2528 | -194.6318 | -63.5791 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.203 | 201] 1.5 [DL + LL] | 3721.1275 | 96.6999 | 754.2704 |
| Bottom | 0.983 | 201] 1.5 [DL + LL] | 3784.8962 | -85.1196 | 70.1001 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3721.1275 | 754.2704 | -217.708 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3784.8962 | 70.1001 | -217.708 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.97 | 201] 1.5 [DL + LL] | 3980.446 | 65.6913 | -55.626 |
| Bottom | 0.985 | 201] 1.5 [DL + LL] | 4044.2146 | -68.1817 | 37.7239 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3980.446 | -55.626 | 29.4559 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4044.2146 | 37.7239 | 29.4559 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.038 | 201] 1.5 [DL + LL] | 4232.0126 | 70.504 | -82.6616 |
| Bottom | 1.04 | 201] 1.5 [DL + LL] | 4295.7812 | -67.7489 | 63.739 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4232.0126 | -82.6616 | 46.2271 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4295.7812 | 63.739 | 46.2271 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.071 | 201] 1.5 [DL + LL] | 4478.3908 | 66.6743 | -50.7758 |
| Bottom | 1.082 | 201] 1.5 [DL + LL] | 4542.1595 | -64.74 | 63.8556 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4478.3908 | -50.7758 | 36.1392 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4542.1595 | 63.8556 | 36.1392 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.108 | 201] 1.5 [DL + LL] | 4718.3729 | 63.4083 | -44.0327 |
| Bottom | 1.12 | 201] 1.5 [DL + LL] | 4782.1415 | -61.4157 | 58.7283 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4718.3729 | -44.0327 | 32.3961 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4782.1415 | 58.7283 | 32.3961 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.156 | 201] 1.5 [DL + LL] | 4951.646 | 59.9737 | -42.524 |
| Bottom | 1.168 | 201] 1.5 [DL + LL] | 5015.4146 | -58.3631 | 55.6633 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4951.646 | -42.524 | 30.9698 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5015.4146 | 55.6633 | 30.9698 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.202 | 201] 1.5 [DL + LL] | 5177.6744 | 55.128 | -38.9692 |
| Bottom | 1.212 | 201] 1.5 [DL + LL] | 5241.443 | -51.5992 | 60.8103 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5177.6744 | -38.9692 | 31.5095 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5241.443 | 60.8103 | 31.5095 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.252 | 201] 1.5 [DL + LL] | 5396.9577 | 56.1241 | -26.7856 |
| Bottom | 1.271 | 201] 1.5 [DL + LL] | 5460.7263 | -63.4942 | 70.9745 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5396.9577 | -26.7856 | 30.9476 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5460.7263 | 70.9745 | 30.9476 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.266 | 201] 1.5 [DL + LL] | 5603.4054 | 21.6445 | -10.6995 |
| Bottom | 1.281 | 201] 1.5 [DL + LL] | 5669.1985 | 24.6436 | -65.7317 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5603.4054 | -10.6995 | -16.9701 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5669.1985 | -65.7317 | -16.9701 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.596 | 201] 1.5 [DL + LL] | 6162.7658 | -158.7325 | 50.3916 |
| Bottom | 1.627 | 201] 1.5 [DL + LL] | 6247.7907 | 161.2323 | -101.5975 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6162.7658 | 50.3916 | -36.3562 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6247.7907 | -101.5975 | -36.3562 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.733 | 201] 1.5 [DL + LL] | 6761.1456 | -167.2836 | 53.8039 |
| Bottom | 1.754 | 201] 1.5 [DL + LL] | 6842.5265 | 169.4755 | 51.3062 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6761.1456 | 53.8039 | -0.8336 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6842.5265 | 51.3062 | -0.8336 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.633 | 201] 1.5 [DL + LL] | 1370.4322 | -32.3168 | 172.4107 |
| Bottom | 0.556 | 201] 1.5 [DL + LL] | 1412.9446 | 29.7749 | 25.8169 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1370.4322 | 172.4107 | -46.8404 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1412.9446 | 25.8169 | -46.8404 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.616 | 201] 1.5 [DL + LL] | 1564.4314 | -31.2348 | -51.4042 |
| Bottom | 0.625 | 201] 1.5 [DL + LL] | 1606.9439 | 30.9282 | 40.4258 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1564.4314 | -51.4042 | 28.9013 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1606.9439 | 40.4258 | 28.9013 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.679 | 201] 1.5 [DL + LL] | 1761.351 | -32.7412 | -37.7597 |
| Bottom | 0.692 | 201] 1.5 [DL + LL] | 1803.8635 | 32.3387 | 42.9192 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1761.351 | -37.7597 | 25.3287 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1803.8635 | 42.9192 | 25.3287 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.741 | 201] 1.5 [DL + LL] | 1959.676 | -32.8011 | -35.4009 |
| Bottom | 0.756 | 201] 1.5 [DL + LL] | 2002.1884 | 32.6997 | 42.6025 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1959.676 | -35.4009 | 24.4687 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2002.1884 | 42.6025 | 24.4687 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.803 | 201] 1.5 [DL + LL] | 2158.7807 | -32.9128 | -36.0523 |
| Bottom | 0.818 | 201] 1.5 [DL + LL] | 2201.2932 | 32.7363 | 42.469 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2158.7807 | -36.0523 | 24.6266 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2201.2932 | 42.469 | 24.6266 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.866 | 201] 1.5 [DL + LL] | 2358.3043 | -32.7974 | -36.7268 |
| Bottom | 0.88 | 201] 1.5 [DL + LL] | 2400.8168 | 32.5198 | 42.5557 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2358.3043 | -36.7268 | 24.8633 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2400.8168 | 42.5557 | 24.8633 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.927 | 201] 1.5 [DL + LL] | 2557.9334 | -32.4503 | -37.368 |
| Bottom | 0.942 | 201] 1.5 [DL + LL] | 2600.4459 | 32.0689 | 42.7808 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2557.9334 | -37.368 | 25.1353 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2600.4459 | 42.7808 | 25.1353 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.988 | 201] 1.5 [DL + LL] | 2757.355 | -31.8564 | -38.0523 |
| Bottom | 1.003 | 201] 1.5 [DL + LL] | 2799.8674 | 31.4051 | 43.1393 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2757.355 | -38.0523 | 25.4651 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2799.8674 | 43.1393 | 25.4651 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.048 | 201] 1.5 [DL + LL] | 2956.2392 | -30.9551 | -38.7912 |
| Bottom | 1.062 | 201] 1.5 [DL + LL] | 2998.7517 | 30.3042 | 42.854 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2956.2392 | -38.7912 | 25.6088 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2998.7517 | 42.854 | 25.6088 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.114 | 201] 1.5 [DL + LL] | 3154.3232 | -30.0851 | -40.3922 |
| Bottom | 1.128 | 201] 1.5 [DL + LL] | 3196.8356 | 29.9902 | 43.6598 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3154.3232 | -40.3922 | 26.3693 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3196.8356 | 43.6598 | 26.3693 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.95 | 201] 1.5 [DL + LL] | 3350.9708 | -27.2453 | -41.253 |
| Bottom | 0.955 | 201] 1.5 [DL + LL] | 3393.4833 | 25.1251 | 87.2282 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3350.9708 | -41.253 | 40.5365 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3393.4833 | 87.2282 | 40.5365 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.011 | 201] 1.5 [DL + LL] | 3545.335 | -29.8965 | 3.0809 |
| Bottom | 1.042 | 201] 1.5 [DL + LL] | 3587.8474 | 32.9207 | -200.44 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3545.335 | 3.0809 | -64.9406 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3587.8474 | -200.44 | -64.9406 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.217 | 201] 1.5 [DL + LL] | 3786.3419 | -97.7872 | 756.2524 |
| Bottom | 1 | 201] 1.5 [DL + LL] | 3850.1105 | 86.3136 | 77.997 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3786.3419 | 756.2524 | -215.8589 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3850.1105 | 77.997 | -215.8589 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.985 | 201] 1.5 [DL + LL] | 4051.2013 | -66.3324 | -54.6478 |
| Bottom | 1.003 | 201] 1.5 [DL + LL] | 4114.97 | 69.1925 | 43.0021 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4051.2013 | -54.6478 | 30.812 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4114.97 | 43.0021 | 30.812 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 201] 1.5 [DL + LL] | 4307.4164 | -70.5886 | -83.0659 |
| Bottom | 1.057 | 201] 1.5 [DL + LL] | 4371.185 | 68.2258 | 66.0372 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4307.4164 | -83.0659 | 47.0834 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4371.185 | 66.0372 | 47.0834 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.086 | 201] 1.5 [DL + LL] | 4557.559 | -66.5067 | -53.0812 |
| Bottom | 1.098 | 201] 1.5 [DL + LL] | 4621.3276 | 64.8759 | 65.7388 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4557.559 | -53.0812 | 37.4683 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4621.3276 | 65.7388 | 37.4683 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.125 | 201] 1.5 [DL + LL] | 4800.4598 | -62.9715 | -45.5739 |
| Bottom | 1.137 | 201] 1.5 [DL + LL] | 4864.2285 | 61.2419 | 60.1551 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4800.4598 | -45.5739 | 33.3386 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4864.2285 | 60.1551 | 33.3386 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.174 | 201] 1.5 [DL + LL] | 5035.8016 | -59.3108 | -43.2416 |
| Bottom | 1.187 | 201] 1.5 [DL + LL] | 5099.5702 | 57.9727 | 56.4763 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5035.8016 | -43.2416 | 31.4576 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5099.5702 | 56.4763 | 31.4576 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.22 | 201] 1.5 [DL + LL] | 5263.0131 | -54.1444 | -38.925 |
| Bottom | 1.23 | 201] 1.5 [DL + LL] | 5326.7818 | 50.6982 | 60.8501 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5263.0131 | -38.925 | 31.5121 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5326.7818 | 60.8501 | 31.5121 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.271 | 201] 1.5 [DL + LL] | 5482.5929 | -55.3217 | -26.0031 |
| Bottom | 1.291 | 201] 1.5 [DL + LL] | 5546.3615 | 63.725 | 67.7268 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5482.5929 | -26.0031 | 29.6733 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5546.3615 | 67.7268 | 29.6733 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.282 | 201] 1.5 [DL + LL] | 5687.9973 | -18.2393 | -11.4261 |
| Bottom | 1.306 | 201] 1.5 [DL + LL] | 5753.7903 | -31.362 | -72.0808 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5687.9973 | -11.4261 | -18.7051 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5753.7903 | -72.0808 | -18.7051 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.767 | 201] 1.5 [DL + LL] | 6223.4844 | 208.4817 | 59.4153 |
| Bottom | 1.801 | 201] 1.5 [DL + LL] | 6308.5093 | -210.9814 | -101.5064 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6223.4844 | 59.4153 | -38.4791 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6308.5093 | -101.5064 | -38.4791 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.833 | 201] 1.5 [DL + LL] | 6813.6785 | 199.3623 | 50.7247 |
| Bottom | 1.854 | 201] 1.5 [DL + LL] | 6895.0595 | -201.5542 | 50.2198 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6813.6785 | 50.7247 | -0.3324 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6895.0595 | 50.2198 | -0.3324 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.706 | 201] 1.5 [DL + LL] | 966.5203 | -126.8377 | -80.2794 |
| Bottom | 1.164 | 201] 1.5 [DL + LL] | 1009.0328 | 107.7414 | -18.5029 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 966.5203 | -80.2794 | 19.6202 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1009.0328 | -18.5029 | 19.6202 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.998 | 201] 1.5 [DL + LL] | 1272.6008 | -93.6588 | 64.9812 |
| Bottom | 1 | 201] 1.5 [DL + LL] | 1315.1132 | 96.8658 | -36.5242 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1272.6008 | 64.9812 | -32.2112 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1315.1132 | -36.5242 | -32.2112 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.059 | 201] 1.5 [DL + LL] | 1574.7748 | -98.3651 | 49.9942 |
| Bottom | 1.05 | 201] 1.5 [DL + LL] | 1617.2873 | 97.7822 | -43.0659 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1574.7748 | 49.9942 | -29.4892 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1617.2873 | -43.0659 | -29.4892 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.083 | 201] 1.5 [DL + LL] | 1874.9833 | -96.2614 | 43.5837 |
| Bottom | 1.094 | 201] 1.5 [DL + LL] | 1917.4957 | 96.5631 | -43.4054 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1874.9833 | 43.5837 | -27.5461 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1917.4957 | -43.4054 | -27.5461 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.12 | 201] 1.5 [DL + LL] | 2173.6016 | -95.7259 | 42.1556 |
| Bottom | 1.13 | 201] 1.5 [DL + LL] | 2216.114 | 95.9232 | -42.6232 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2173.6016 | 42.1556 | -26.8368 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2216.114 | -42.6232 | -26.8368 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.183 | 201] 1.5 [DL + LL] | 2471.2736 | -95.161 | 41.5172 |
| Bottom | 1.196 | 201] 1.5 [DL + LL] | 2513.7861 | 95.4089 | -41.6986 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2471.2736 | 41.5172 | -26.3343 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2513.7861 | -41.6986 | -26.3343 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.226 | 201] 1.5 [DL + LL] | 2768.5675 | -94.8432 | 40.7998 |
| Bottom | 1.238 | 201] 1.5 [DL + LL] | 2811.0799 | 95.1219 | -40.8472 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2768.5675 | 40.7998 | -25.8304 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2811.0799 | -40.8472 | -25.8304 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.303 | 201] 1.5 [DL + LL] | 3066.0524 | -94.6901 | 39.7735 |
| Bottom | 1.315 | 201] 1.5 [DL + LL] | 3108.5648 | 94.9916 | -39.8545 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3066.0524 | 39.7735 | -25.1849 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3108.5648 | -39.8545 | -25.1849 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.329 | 201] 1.5 [DL + LL] | 3364.3105 | -94.7841 | 38.6115 |
| Bottom | 1.342 | 201] 1.5 [DL + LL] | 3406.823 | 95.2473 | -38.4944 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3364.3105 | 38.6115 | -24.381 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3406.823 | -38.4944 | -24.381 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 201] 1.5 [DL + LL] | 3663.8559 | -94.7301 | 37.6233 |
| Bottom | 1.419 | 201] 1.5 [DL + LL] | 3706.3683 | 94.69 | -39.2935 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3663.8559 | 37.6233 | -24.321 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3706.3683 | -39.2935 | -24.321 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.439 | 201] 1.5 [DL + LL] | 3965.6248 | -96.5429 | 33.7477 |
| Bottom | 1.472 | 201] 1.5 [DL + LL] | 4008.1373 | 98.8021 | -77.6727 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3965.6248 | 33.7477 | -35.3686 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4008.1373 | -77.6727 | -35.3686 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.494 | 201] 1.5 [DL + LL] | 4268.9402 | -91.4902 | -11.78 |
| Bottom | 1.561 | 201] 1.5 [DL + LL] | 4311.4527 | 82.9007 | 259.5868 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4268.9402 | -11.78 | 86.3416 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4311.4527 | 259.5868 | 86.3416 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.342 | 201] 1.5 [DL + LL] | 4541.148 | -83.4267 | -984.7404 |
| Bottom | 1.131 | 201] 1.5 [DL + LL] | 4604.9166 | 79.1296 | -70.6636 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4541.148 | -984.7404 | 290.8356 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4604.9166 | -70.6636 | 290.8356 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.165 | 201] 1.5 [DL + LL] | 4823.0203 | -77.8335 | -41.8744 |
| Bottom | 1.172 | 201] 1.5 [DL + LL] | 4886.7889 | 78.3587 | 15.8158 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4823.0203 | -41.8744 | 18.3113 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4886.7889 | 15.8158 | 18.3113 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.218 | 201] 1.5 [DL + LL] | 5109.1143 | -76.7668 | 39.5043 |
| Bottom | 1.223 | 201] 1.5 [DL + LL] | 5172.883 | 76.8889 | -4.3619 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5109.1143 | 39.5043 | -13.8654 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5172.883 | -4.3619 | -13.8654 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.271 | 201] 1.5 [DL + LL] | 5397.5733 | -75.751 | 18.1843 |
| Bottom | 1.286 | 201] 1.5 [DL + LL] | 5461.342 | 75.8213 | -10.5826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5397.5733 | 18.1843 | -9.0304 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5461.342 | -10.5826 | -9.0304 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.336 | 201] 1.5 [DL + LL] | 5688.8432 | -74.7339 | 9.0156 |
| Bottom | 1.35 | 201] 1.5 [DL + LL] | 5752.6118 | 74.7622 | -10.6265 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5688.8432 | 9.0156 | -6.1321 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5752.6118 | -10.6265 | -6.1321 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.4 | 201] 1.5 [DL + LL] | 5983.1292 | -73.7825 | 5.5196 |
| Bottom | 1.414 | 201] 1.5 [DL + LL] | 6046.8978 | 74.0187 | -11.1372 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5983.1292 | 5.5196 | -5.1975 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6046.8978 | -11.1372 | -5.1975 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.466 | 201] 1.5 [DL + LL] | 6280.8561 | -72.498 | 0.9914 |
| Bottom | 1.479 | 201] 1.5 [DL + LL] | 6344.6248 | 72.1277 | -15.3047 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6280.8561 | 0.9914 | -5.1145 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6344.6248 | -15.3047 | -5.1145 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.532 | 201] 1.5 [DL + LL] | 6581.518 | -72.5791 | -6.9305 |
| Bottom | 1.549 | 201] 1.5 [DL + LL] | 6645.2867 | 75.6525 | 5.2722 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6581.518 | -6.9305 | 3.8826 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6645.2867 | 5.2722 | 3.8826 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.595 | 201] 1.5 [DL + LL] | 6890.2983 | -66.3476 | 4.8298 |
| Bottom | 1.601 | 201] 1.5 [DL + LL] | 6956.0914 | 57.8916 | -31.1984 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6890.2983 | 4.8298 | -11.0982 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6956.0914 | -31.1984 | -11.0982 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.026 | 201] 1.5 [DL + LL] | 7147.0212 | -240.3725 | 43.8415 |
| Bottom | 2.059 | 201] 1.5 [DL + LL] | 7232.0461 | 242.8723 | -81.3024 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7147.0212 | 43.8415 | -29.8596 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7232.0461 | -81.3024 | -29.8596 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.886 | 201] 1.5 [DL + LL] | 7461.4658 | -173.9596 | 63.4075 |
| Bottom | 1.895 | 201] 1.5 [DL + LL] | 7542.8468 | 176.1515 | -2.3441 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7461.4658 | 63.4075 | -16.4341 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7542.8468 | -2.3441 | -16.4341 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.72 | 201] 1.5 [DL + LL] | 1718.4909 | 24.2018 | 234.9698 |
| Bottom | 0.631 | 201] 1.5 [DL + LL] | 1761.0033 | -21.1887 | 0.7759 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1718.4909 | 234.9698 | -74.6276 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1761.0033 | 0.7759 | -74.6276 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.698 | 201] 1.5 [DL + LL] | 1936.265 | 19.2287 | -80.0191 |
| Bottom | 0.707 | 201] 1.5 [DL + LL] | 1978.7774 | -20.5665 | 40.8502 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1936.265 | -80.0191 | 38.1127 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 1978.7774 | 40.8502 | 38.1127 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.764 | 201] 1.5 [DL + LL] | 2155.6533 | 20.2084 | -43.5658 |
| Bottom | 0.779 | 201] 1.5 [DL + LL] | 2198.1658 | -20.5978 | 46.2261 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2155.6533 | -43.5658 | 28.1782 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2198.1658 | 46.2261 | 28.1782 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.837 | 201] 1.5 [DL + LL] | 2376.0349 | 21.4026 | -38.7203 |
| Bottom | 0.852 | 201] 1.5 [DL + LL] | 2418.5474 | -21.3503 | 45.8951 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2376.0349 | -38.7203 | 26.5242 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2418.5474 | 45.8951 | 26.5242 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.913 | 201] 1.5 [DL + LL] | 2597.2161 | 22.1875 | -38.879 |
| Bottom | 0.927 | 201] 1.5 [DL + LL] | 2639.7286 | -22.047 | 45.2758 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2597.2161 | -38.879 | 26.3752 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2639.7286 | 45.2758 | 26.3752 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.99 | 201] 1.5 [DL + LL] | 2818.9572 | 22.8227 | -39.1214 |
| Bottom | 1.003 | 201] 1.5 [DL + LL] | 2861.4696 | -22.6273 | 44.6191 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2818.9572 | -39.1214 | 26.242 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 2861.4696 | 44.6191 | 26.242 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.003 | 201] 1.5 [DL + LL] | 3041.026 | 23.3319 | -39.2389 |
| Bottom | 1.016 | 201] 1.5 [DL + LL] | 3083.5385 | -23.0801 | 44.0694 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3041.026 | -39.2389 | 26.1037 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3083.5385 | 44.0694 | 26.1037 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.075 | 201] 1.5 [DL + LL] | 3263.1852 | 23.7348 | -39.0651 |
| Bottom | 1.088 | 201] 1.5 [DL + LL] | 3305.6977 | -23.4026 | 43.7961 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3263.1852 | -39.0651 | 25.9626 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3305.6977 | 43.7961 | 25.9626 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.177 | 201] 1.5 [DL + LL] | 3485.1838 | 24.0606 | -38.375 |
| Bottom | 1.19 | 201] 1.5 [DL + LL] | 3527.6963 | -23.7306 | 42.7504 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3485.1838 | -38.375 | 25.4161 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3527.6963 | 42.7504 | 25.4161 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.25 | 201] 1.5 [DL + LL] | 3706.7477 | 24.0952 | -38.2334 |
| Bottom | 1.263 | 201] 1.5 [DL + LL] | 3749.2601 | -23.3447 | 39.8585 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3706.7477 | -38.2334 | 24.4538 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3749.2601 | 39.8585 | 24.4538 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.107 | 201] 1.5 [DL + LL] | 3927.7347 | 24.9653 | -39.8075 |
| Bottom | 1.113 | 201] 1.5 [DL + LL] | 3970.2471 | -23.8899 | 81.8046 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3927.7347 | -39.8075 | 38.33 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 3970.2471 | 81.8046 | 38.33 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.172 | 201] 1.5 [DL + LL] | 4148.7426 | 25.8195 | 5.58 |
| Bottom | 1.195 | 201] 1.5 [DL + LL] | 4191.2551 | -29.5261 | -226.3857 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4148.7426 | 5.58 | -74.0711 | 144.5538 | 352.4147 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4191.2551 | -226.3857 | -74.0711 | 144.5538 | 352.4147 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.298 | 201] 1.5 [DL + LL] | 4383.031 | 82.99 | 927.9962 |
| Bottom | 1.078 | 201] 1.5 [DL + LL] | 4446.7997 | -72.1138 | 50.184 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4383.031 | 927.9962 | -279.3309 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4446.7997 | 50.184 | -279.3309 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.135 | 201] 1.5 [DL + LL] | 4656.885 | 77.3339 | -62.776 |
| Bottom | 1.137 | 201] 1.5 [DL + LL] | 4720.6537 | -75.1932 | 40.2744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4656.885 | -62.776 | 32.485 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4720.6537 | 40.2744 | 32.485 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.181 | 201] 1.5 [DL + LL] | 4927.7925 | 73.1665 | -68.7556 |
| Bottom | 1.191 | 201] 1.5 [DL + LL] | 4991.5612 | -72.7141 | 61.8131 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4927.7925 | -68.7556 | 41.1637 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 4991.5612 | 61.8131 | 41.1637 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.226 | 201] 1.5 [DL + LL] | 5195.3539 | 72.4131 | -43.9252 |
| Bottom | 1.24 | 201] 1.5 [DL + LL] | 5259.1226 | -71.3274 | 58.6397 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5195.3539 | -43.9252 | 32.2869 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5259.1226 | 58.6397 | 32.2869 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.28 | 201] 1.5 [DL + LL] | 5460.1221 | 71.3771 | -43.5811 |
| Bottom | 1.292 | 201] 1.5 [DL + LL] | 5523.8908 | -70.1041 | 57.336 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5460.1221 | -43.5811 | 31.7897 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5523.8908 | 57.336 | 31.7897 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.337 | 201] 1.5 [DL + LL] | 5722.1667 | 70.2351 | -41.4195 |
| Bottom | 1.349 | 201] 1.5 [DL + LL] | 5785.9354 | -68.8086 | 58.2594 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5722.1667 | -41.4195 | 31.4294 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5785.9354 | 58.2594 | 31.4294 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.394 | 201] 1.5 [DL + LL] | 5981.3559 | 69.1381 | -36.8238 |
| Bottom | 1.406 | 201] 1.5 [DL + LL] | 6045.1246 | -67.5602 | 59.6686 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 5981.3559 | -36.8238 | 30.4686 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6045.1246 | 59.6686 | 30.4686 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.45 | 201] 1.5 [DL + LL] | 6237.5006 | 67.881 | -31.3736 |
| Bottom | 1.461 | 201] 1.5 [DL + LL] | 6301.2692 | -65.5036 | 54.6251 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6237.5006 | -31.3736 | 27.2078 | 356.4 | 668.1913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6301.2692 | 54.6251 | 27.2078 | 356.4 | 668.1913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.507 | 201] 1.5 [DL + LL] | 6490.5715 | 68.0989 | -32.4324 |
| Bottom | 1.525 | 201] 1.5 [DL + LL] | 6556.3646 | -71.7386 | 28.8807 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6490.5715 | -32.4324 | 18.8194 | 338.5241 | 650.3154 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6556.3646 | 28.8807 | 18.8194 | 338.5241 | 650.3154 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.877 | 201] 1.5 [DL + LL] | 6746.1249 | 217.769 | -24.5613 |
| Bottom | 1.897 | 201] 1.5 [DL + LL] | 6831.1498 | -220.2688 | -16.2156 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6746.1249 | -24.5613 | 1.8942 | 243 | 554.7913 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6831.1498 | -16.2156 | 1.8942 | 243 | 554.7913 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.844 | 201] 1.5 [DL + LL] | 6973.6884 | 196.6897 | -23.4442 |
| Bottom | 1.876 | 201] 1.5 [DL + LL] | 7055.0694 | -198.8816 | 65.1159 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 600 | 201] 1.5 [DL + LL] | 6973.6884 | -23.4442 | 21.8649 | 254.8216 | 566.6129 |
| Bottom | Leg 1 | 600 | 201] 1.5 [DL + LL] | 7055.0694 | 65.1159 | 21.8649 | 254.8216 | 566.6129 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 440.2535 | -41.2101 | 26.7106 | 480000 |
| Bottom | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 518.8903 | 43.7086 | 108.0109 | 480000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 440.2535 | 26.7106 | 18.6082 | 325.2571 | 602.4049 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 518.8903 | 108.0109 | 18.6082 | 325.2571 | 602.4049 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 1078.0801 | -38.7116 | -294.8729 | 480000 |
| Bottom | 1200 | 0.0025 | 0.0023 | 201] 1.5 [DL + LL] | 1131.1645 | 10.3333 | 108.1568 | 480000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1078.0801 | -294.8729 | 136.7563 | 920.6519 | 1197.7997 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1131.1645 | 108.1568 | 136.7563 | 920.6519 | 1197.7997 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.083 | 201] 1.5 [DL + LL] | 3541.3718 | 4144.9066 | 1748.4015 |
| Bottom | 0.081 | 201] 1.5 [DL + LL] | 4198.7777 | 3660.3277 | 1235.2367 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 215.4767 | 21.3426 | 16.1246 | 18.5143 | 64.7056 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 991.9305 | 79.3986 | 52.7977 | 604.8 | 881.9478 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 191.1296 | 208.5091 | -208.4948 | 1504 | 1989.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 106.1395 | 14.2874 | -8.8729 | 48 | 140.3826 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 104.1582 | -35.5716 | 88.8302 | 364.2545 | 606.7589 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 118.6911 | -342.4718 | 101.798 | 732.8571 | 1021.5528 |
| Top | Leg 7 | 1386.92 | 201] 1.5 [DL + LL] | -124.7974 | 4.9812 | -178.6733 | 18.5143 | 178.6733 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 29.2111 | -30.6681 | 12.6476 | 48 | 140.3826 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 209.6734 | 281.4681 | -315.4579 | 1504 | 1989.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 734.7844 | -305.6317 | 351.4002 | 364.2545 | 606.7589 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 607.9705 | 68.5173 | 41.3811 | 18.5143 | 64.7056 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 107.611 | 42.4715 | -18.0203 | 364.2545 | 606.7589 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 727.8137 | -1251.4162 | 43.7198 | 732.8571 | 1021.5528 |
| Top | Leg 14 | OS | 201] 1.5 [DL + LL] | -529.4576 | -19.0422 | 679.9589 | 18.5143 | 64.7056 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 51.0371 | -5.4747 | 26.8487 | 364.2545 | 606.7589 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | -26.492 | -20.7342 | 10.7913 | 18.5143 | 64.7056 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 805.3327 | 1.8046 | 33.0471 | 604.8 | 881.9478 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 678.9111 | 328.9906 | -200.7486 | 1504 | 1989.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 34.1816 | -14.3461 | -10.6774 | 48 | 140.3826 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 255.3255 | 4.9865 | -11.1267 | 364.2545 | 606.7589 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | -68.9753 | 373.1597 | 106.5927 | 732.8571 | 1021.5528 |
| Bottom | Leg 7 | 1624.14 | 201] 1.5 [DL + LL] | 78.1808 | -1.9308 | -206.0672 | 18.5143 | 206.0672 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 34.9832 | 0.8507 | 8.0556 | 48 | 140.3826 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 644.7086 | 269.0637 | -289.7545 | 1504 | 1989.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 804.8492 | 52.2374 | -111.9988 | 364.2545 | 606.7589 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 75.2646 | -24.9628 | 7.595 | 18.5143 | 64.7056 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 232.5556 | -9.2435 | 14.2765 | 364.2545 | 606.7589 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | -32.4202 | 391.2441 | 124.038 | 732.8571 | 1021.5528 |
| Bottom | Leg 14 | 521.46 | 201] 1.5 [DL + LL] | 327.8437 | -49.0622 | 78.7313 | 18.5143 | 78.7313 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 354.5286 | -0.2439 | 5.0102 | 364.2545 | 606.7589 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 0

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.087 | 201] 1.5 [DL + LL] | 5432.6406 | 3117.8572 | 1016.6614 |
| Bottom | 0.091 | 201] 1.5 [DL + LL] | 6069.5025 | 2802.1602 | 966.9003 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 268.0301 | 19.2934 | 20.0562 | 18.6667 | 64.858 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 720.4754 | 75.2864 | -45.9097 | 678.8571 | 956.005 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 685.2803 | 387.186 | -186.7431 | 1520 | 2005.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 78.0975 | 1.3803 | -2.3705 | 48.8348 | 141.2174 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 273.2602 | -3.9673 | 10.0287 | 393.12 | 635.6243 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 471.6838 | -204.0155 | 67.4792 | 840 | 1128.6957 |
| Top | Leg 7 | 1610.37 | 201] 1.5 [DL + LL] | -108.7295 | -1.5849 | -204.6297 | 18.6667 | 204.6297 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 98.3627 | 8.0828 | -5.2224 | 48.8348 | 141.2174 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 677.6495 | 378.9991 | -241.8471 | 1520 | 2005.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 737.503 | 30.7589 | -41.4665 | 393.12 | 635.6243 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 328.6558 | 18.3549 | 21.5925 | 18.6667 | 64.858 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 259.1669 | 3.3389 | -17.503 | 393.12 | 635.6243 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 420.2168 | -89.3323 | 101.3989 | 840 | 1128.6957 |
| Top | Leg 14 | 1554.53 | 201] 1.5 [DL + LL] | 147.0027 | -17.2715 | 198.1813 | 18.6667 | 198.1813 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 375.9854 | 1.1787 | 2.1557 | 393.12 | 635.6243 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | -9.5319 | -18.2078 | 15.2879 | 18.6667 | 64.858 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 847.9295 | -34.075 | -33.066 | 678.8571 | 956.005 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 961.2945 | 279.9755 | -159.816 | 1520 | 2005.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 84.9241 | -4.2083 | -2.2621 | 48.8348 | 141.2174 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 447.5096 | 11.4581 | 29.9039 | 393.12 | 635.6243 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 159.8943 | 350.8058 | 64.3974 | 840 | 1128.6957 |
| Bottom | Leg 7 | 1455.4 | 201] 1.5 [DL + LL] | 142.1824 | 3.2935 | -186.7336 | 18.6667 | 186.7336 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 108.1471 | -1.1291 | -2.9508 | 48.8348 | 141.2174 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 991.6914 | 240.2666 | -203.6854 | 1520 | 2005.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 802.3125 | 36.3608 | -35.1522 | 393.12 | 635.6243 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 27.6152 | -18.0332 | 17.2152 | 18.6667 | 64.858 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 462.9057 | -8.4526 | -25.5358 | 393.12 | 635.6243 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 364.2538 | 216.0405 | 97.8578 | 840 | 1128.6957 |
| Bottom | Leg 14 | 1229.76 | 201] 1.5 [DL + LL] | 137.6163 | 3.2566 | 160.6777 | 18.6667 | 160.6777 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 540.758 | -0.3642 | -8.8666 | 393.12 | 635.6243 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.102 | 201] 1.5 [DL + LL] | 7187.5834 | 2404.7628 | 691.5789 |
| Bottom | 0.109 | 201] 1.5 [DL + LL] | 7834.7173 | 2261.124 | 652.8607 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 270.0376 | 18.9054 | 17.8269 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 784.0148 | 57.7729 | -57.133 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 964.5974 | 321.3973 | -145.2 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 135.9288 | 6.695 | -4.5433 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 457.8056 | -1.5644 | 32.4291 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 651.1435 | -189.2157 | 62.1285 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1482.93 | 201] 1.5 [DL + LL] | -43.2368 | 0.3054 | -189.8349 | 18.5891 | 189.8349 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 154.9164 | -3.5639 | 1.7124 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1016.0442 | 323.13 | -166.3673 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 749.1352 | -9.0629 | 18.7661 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 276.7072 | 18.7534 | 17.9405 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 477.0461 | 5.2033 | -32.1886 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 743.1475 | -200.4059 | 66.9029 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 1097.67 | 201] 1.5 [DL + LL] | -4.1192 | 3.1392 | 145.3462 | 18.5891 | 145.3462 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 554.4151 | 4.2599 | -9.9543 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 15.448 | -17.7916 | 13.9711 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 946.2666 | -39.5206 | -48.4359 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1235.9135 | 233.5773 | -124.5571 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 150.3694 | -5.2083 | -3.6836 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 597.5734 | 10.3421 | 30.8335 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 386.76 | 315.1507 | 62.7272 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 1351.51 | 201] 1.5 [DL + LL] | 171.11 | 1.9375 | -174.659 | 18.5891 | 174.659 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 168.3925 | 1.7834 | 1.1448 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1274.1821 | 202.4673 | -136.1737 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 852.0665 | 31.3706 | 22.8744 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 38.7967 | -17.9228 | 13.3695 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 624.75 | -6.2957 | -33.025 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 520.0334 | 247.7284 | 64.8801 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 1060.28 | 201] 1.5 [DL + LL] | 173.0648 | -2.2342 | 141.0284 | 18.5891 | 141.0284 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 679.9904 | -0.2551 | -15.4948 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.121 | 201] 1.5 [DL + LL] | 8932.5613 | 1915.9752 | 427.7965 |
| Bottom | 0.13 | 201] 1.5 [DL + LL] | 9579.6952 | 1937.5869 | 403.6748 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 287.6254 | 18.1588 | 18.4934 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 895.101 | 56.1056 | -59.2258 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1237.8384 | 267.2959 | -113.7558 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 200.8714 | 5.2116 | -4.0239 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 606.8101 | -3.5145 | 37.9761 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 850.7178 | -196.0187 | 64.7654 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1393.65 | 201] 1.5 [DL + LL] | -3.0858 | -0.4047 | -179.5251 | 18.5891 | 179.5251 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 216.5709 | -0.9603 | 0.7637 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1294.7452 | 270.6449 | -117.287 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 807.9385 | -23.8314 | 38.3752 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 286.3788 | 17.8077 | 18.7867 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 636.2664 | 9.2776 | -42.6802 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 887.5521 | -159.4964 | 56.8932 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 1095.63 | 201] 1.5 [DL + LL] | 35.7791 | 0.8218 | 145.1101 | 18.5891 | 145.1101 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 691.4521 | 5.5354 | -15.7867 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 42.3482 | -17.0089 | 13.7073 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1068.7082 | -39.1154 | -51.2512 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1509.1725 | 205.7598 | -99.6435 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 210.1796 | -4.3292 | -2.5448 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 743.1423 | 8.7821 | 34.3474 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 592.4028 | 296.5894 | 66.6715 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 1254.59 | 201] 1.5 [DL + LL] | 200.5826 | 2.2074 | -163.4665 | 18.5891 | 163.4665 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 224.3048 | 0.8798 | -0.1285 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1538.0547 | 177.2753 | -99.16 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 942.2291 | 30.0672 | 38.3382 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 58.5708 | -16.9827 | 13.1917 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 761.5169 | -8.2925 | -38.8544 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 684.3343 | 236.2039 | 57.4906 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 1010.61 | 201] 1.5 [DL + LL] | 194.5451 | -1.7611 | 135.2928 | 18.5891 | 135.2928 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 809.6033 | -1.3285 | -16.4406 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.144 | 201] 1.5 [DL + LL] | 10652.9024 | 1645.005 | 208.0508 |
| Bottom | 0.153 | 201] 1.5 [DL + LL] | 11300.0363 | 1745.9766 | 187.8026 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 304.7211 | 17.4087 | 18.7028 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1029.3713 | 57.6409 | -60.3131 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1510.4373 | 234.2793 | -93.2958 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 260.9035 | 5.0238 | -4.0359 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 752.2282 | -5.9065 | 42.3238 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1028.5214 | -186.0686 | 65.0434 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1315.51 | 201] 1.5 [DL + LL] | 37.6953 | -0.1121 | -170.5013 | 18.5891 | 170.5013 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 272.2989 | -1.9209 | 1.3966 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1557.822 | 239.0381 | -92.2338 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 907.0576 | -28.8098 | 43.1724 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 299.326 | 17.0983 | 18.9126 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 771.7468 | 8.1108 | -46.6921 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1035.8878 | -154.8242 | 56.4741 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 1051.69 | 201] 1.5 [DL + LL] | 64.4926 | 0.7159 | 140.0368 | 18.5891 | 140.0368 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 820.3926 | 4.5224 | -16.3468 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 71.6228 | -16.0197 | 13.2608 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1200.3531 | -40.4392 | -51.5027 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1776.4236 | 186.3145 | -85.4352 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 266.7465 | -3.8053 | -1.8593 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 886.8262 | 5.5744 | 35.16 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 788.1669 | 280.3045 | 67.8748 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 1157.04 | 201] 1.5 [DL + LL] | 223.4696 | 2.1213 | -152.2022 | 18.5891 | 152.2022 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 276.9463 | 0.6874 | -0.2218 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1793.4551 | 161.9815 | -83.1532 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1046.255 | 30.4754 | 42.5364 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 82.57 | -15.9489 | 12.9952 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 892.0268 | -8.0727 | -38.4989 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 842.7736 | 229.609 | 58.9784 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 941.13 | 201] 1.5 [DL + LL] | 214.7819 | -1.9148 | 127.2691 | 18.5891 | 127.2691 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 937.6189 | -2.1669 | -14.0813 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.166 | 201] 1.5 [DL + LL] | 12344.7658 | 1501.7518 | 20.2003 |
| Bottom | 0.175 | 201] 1.5 [DL + LL] | 12991.8997 | 1657.7727 | 13.9071 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 322.3079 | 16.966 | 18.3199 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1171.8315 | 55.6972 | -55.9211 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 1777.1538 | 211.9382 | -83.0801 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 317.8307 | 4.5004 | -4.1331 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 896.2654 | -9.8853 | 47.4948 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1195.9689 | -173.0294 | 75.3973 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1236.51 | 201] 1.5 [DL + LL] | 72.0322 | -0.1133 | -161.3795 | 18.5891 | 161.3795 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 325.4061 | -2.2675 | 1.8898 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 1813.1914 | 221.7131 | -83.5091 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1019.1223 | -29.2495 | 38.4497 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 313.9238 | 16.6861 | 18.3907 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 902.3956 | 8.5335 | -48.7072 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1177.2212 | -143.8202 | 63.0034 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 1012.13 | 201] 1.5 [DL + LL] | 92.0456 | 0.3885 | 135.4678 | 18.5891 | 135.4678 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 948.0695 | 3.0572 | -13.8258 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 101.2015 | -15.5795 | 14.2092 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1329.7287 | -37.6637 | -47.4513 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2043.7802 | 168.2645 | -82.3404 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 321.2116 | -3.8666 | -1.2891 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1034.0022 | -2.7615 | 33.472 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 975.5976 | 282.505 | 73.7633 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 1135.75 | 201] 1.5 [DL + LL] | 231.3074 | 1.3567 | -149.7433 | 18.5891 | 149.7433 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 328.2912 | 0.5174 | -0.4878 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2051.383 | 148.5711 | -81.9821 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1150.1297 | 26.1434 | 40.8041 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 106.6165 | -15.634 | 14.3287 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1027.1811 | -2.7302 | -32.0172 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1000.6168 | 232.8207 | 61.9446 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 934.35 | 201] 1.5 [DL + LL] | 223.0545 | -1.4314 | 126.4863 | 18.5891 | 126.4863 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1067.7978 | -2.4649 | -9.2483 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.189 | 201] 1.5 [DL + LL] | 14122.6712 | 1418.9296 | -133.9394 |
| Bottom | 0.198 | 201] 1.5 [DL + LL] | 14769.8051 | 1384.2899 | -78.6107 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 347.7932 | 16.8593 | 19.3155 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1319.8872 | 43.9219 | -41.1253 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2045.5311 | 193.8289 | -86.8556 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 371.804 | 3.2716 | -3.1754 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1041.1131 | -18.8206 | 58.2919 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1389.5691 | -147.5487 | 57.9219 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1223.01 | 201] 1.5 [DL + LL] | 101.0618 | 0.1724 | -159.8197 | 18.5891 | 159.8197 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 376.4331 | -2.9372 | 2.3649 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2072.0107 | 208.4702 | -88.6786 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1139.3391 | -22.969 | 28.5589 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 337.7966 | 16.6219 | 19.2612 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1035.4365 | 12.9542 | -51.2876 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1347.8125 | -124.4566 | 47.3191 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 1022.2 | 201] 1.5 [DL + LL] | 118.6301 | -0.1763 | 136.6312 | 18.5891 | 136.6312 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1078.4531 | 1.5922 | -8.8838 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 119.6158 | -16.2329 | 13.7814 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1476.5748 | -28.0302 | -40.7177 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2332.7005 | 149.6176 | -87.0196 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 385.3033 | -2.3827 | -0.3039 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1165.4132 | 10.1011 | 48.4062 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1139.4741 | 249.137 | 58.9668 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 1114.57 | 201] 1.5 [DL + LL] | 272.7739 | 1.2156 | -147.2975 | 18.5891 | 147.2975 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 389.0194 | 0.9787 | 0.0459 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2327.8011 | 133.3847 | -86.4783 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1273.7394 | 19.073 | 38.8398 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 123.1278 | -16.2125 | 13.9852 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1151.4464 | -13.6626 | -39.3712 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1152.0104 | 207.0823 | 49.068 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 936.25 | 201] 1.5 [DL + LL] | 260.3296 | -0.9158 | 126.7061 | 18.5891 | 126.7061 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1200.4754 | -2.5432 | -4.5928 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.212 | 201] 1.5 [DL + LL] | 15903.8288 | 1187.1788 | -210.314 |
| Bottom | 0.22 | 201] 1.5 [DL + LL] | 16550.9627 | 1218.5662 | -150.6832 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 366.5801 | 16.9365 | 20.3675 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1471.8119 | 51.1576 | -45.1443 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2334.7038 | 174.93 | -84.038 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 435.51 | 3.7564 | -3.1224 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1172.1938 | -6.8099 | 52.4645 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1541.22 | -170.4995 | 63.3747 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1167.97 | 201] 1.5 [DL + LL] | 148.8747 | -0.393 | -153.4637 | 18.5891 | 153.4637 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 436.9766 | -3.0267 | 2.3825 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2348.7523 | 193.4222 | -88.3651 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1266.3835 | -28.9392 | 32.8185 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 357.0066 | 16.7097 | 20.5278 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1159.6468 | 1.645 | -42.3122 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1492.7612 | -145.7804 | 52.851 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 985.27 | 201] 1.5 [DL + LL] | 160.3463 | 0.3252 | 132.3661 | 18.5891 | 132.3661 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1211.0611 | 0.4294 | -4.47 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 151.9599 | -16.1252 | 12.3399 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1613.5989 | -28.9523 | -41.0479 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2604.6673 | 129.7581 | -81.2707 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 444.0061 | -2.423 | -0.5292 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1301.4297 | 5.8931 | 36.4029 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1329.9199 | 238.9932 | 68.454 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 1052.97 | 201] 1.5 [DL + LL] | 296.9987 | 1.2051 | -140.1846 | 18.5891 | 140.1846 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 444.8762 | 1.4749 | 0.4083 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2590.837 | 118.1403 | -81.9193 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1390.3959 | 20.0875 | 39.1692 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 153.6865 | -16.03 | 12.6989 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1283.327 | -8.9152 | -26.6245 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1331.1898 | 203.0305 | 57.6257 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 895.06 | 201] 1.5 [DL + LL] | 282.9418 | -0.8144 | 121.9489 | 18.5891 | 121.9489 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1331.1281 | -2.7888 | -2.4575 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.234 | 201] 1.5 [DL + LL] | 17664.854 | 1051.0809 | -268.1342 |
| Bottom | 0.243 | 201] 1.5 [DL + LL] | 18311.9879 | 1079.7667 | -212.4783 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 391.7654 | 16.2398 | 20.9201 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1614.7753 | 50.3933 | -44.3014 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2605.2687 | 153.4067 | -77.7703 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 494.0704 | 3.4244 | -3.0669 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1308.9057 | -9.3925 | 48.828 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1715.227 | -162.1495 | 62.0313 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1122.31 | 201] 1.5 [DL + LL] | 179.9948 | -0.1218 | -148.1912 | 18.5891 | 148.1912 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 492.81 | -2.7406 | 2.3985 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2611.011 | 177.5491 | -83.454 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1387.2629 | -28.5277 | 31.4363 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 381.4963 | 15.976 | 21.1305 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1292.177 | 4.6748 | -39.1546 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1661.216 | -137.6762 | 52.4627 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 955.56 | 201] 1.5 [DL + LL] | 187.6829 | 0.0929 | 128.936 | 18.5891 | 128.936 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1341.1907 | -0.3035 | -2.5229 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 180.7389 | -15.4621 | 11.8869 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1754.8166 | -29.9223 | -37.7757 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2870.3524 | 113.3377 | -75.2153 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 500.9929 | -2.0978 | -0.0274 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1439.0968 | 3.5527 | 35.2042 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1512.1806 | 229.2625 | 65.4892 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 989.4 | 201] 1.5 [DL + LL] | 322.5624 | 1.3327 | -132.8432 | 18.5891 | 132.8432 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 499.5635 | 1.1932 | -0.0209 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2851.5578 | 107.2434 | -77.4112 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1511.1561 | 21.0835 | 37.0886 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 180.6346 | -15.3295 | 12.3697 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1417.8527 | -6.7157 | -26.0335 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1503.0731 | 198.8157 | 55.5047 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 847.56 | 201] 1.5 [DL + LL] | 307.5353 | -0.9649 | 116.4642 | 18.5891 | 116.4642 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1459.8742 | -2.9765 | -1.7447 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.257 | 201] 1.5 [DL + LL] | 19405.5433 | 937.2479 | -317.0163 |
| Bottom | 0.266 | 201] 1.5 [DL + LL] | 20052.6772 | 967.4156 | -266.5065 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 413.4158 | 15.801 | 21.2294 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1761.3076 | 48.5303 | -42.3453 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 2871.0062 | 135.6029 | -71.3125 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 551.0314 | 3.3292 | -3.1601 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1446.3094 | -11.5945 | 50.9868 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1881.0345 | -154.2054 | 59.8838 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1077.21 | 201] 1.5 [DL + LL] | 212.4415 | 0.0458 | -142.9838 | 18.5891 | 142.9838 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 547.5834 | -2.8901 | 2.6346 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 2872.0776 | 165.9006 | -78.5967 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1511.8875 | -27.2451 | 28.9307 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 402.3246 | 15.5434 | 21.4097 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1426.3792 | 6.8752 | -42.0645 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1821.7913 | -129.8945 | 50.4661 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 926.68 | 201] 1.5 [DL + LL] | 217.0718 | -0.1039 | 125.6004 | 18.5891 | 125.6004 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1469.8818 | -0.6593 | -1.9256 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 209.3048 | -14.9166 | 11.2635 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1896.2043 | -28.5866 | -35.0525 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3136.5486 | 101.5825 | -69.4246 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 556.0236 | -1.7626 | 0.378 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1574.0144 | 3.1542 | 34.9349 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1686.9201 | 218.2719 | 63.6543 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 930.04 | 201] 1.5 [DL + LL] | 347.3163 | 1.3534 | -125.9886 | 18.5891 | 125.9886 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 553.052 | 0.9903 | -0.2726 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3114.2777 | 99.3592 | -73.1261 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1631.725 | 20.1123 | 35.3083 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 207.6539 | -14.789 | 11.7988 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1549.6283 | -6.7859 | -26.3499 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1668.5592 | 191.2511 | 53.8236 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 802.59 | 201] 1.5 [DL + LL] | 331.8776 | -0.9999 | 111.2706 | 18.5891 | 111.2706 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1589.5714 | -3.1847 | -1.572 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.279 | 201] 1.5 [DL + LL] | 21124.0846 | 846.1255 | -359.3027 |
| Bottom | 0.288 | 201] 1.5 [DL + LL] | 21771.2185 | 879.0835 | -314.1983 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 434.246 | 15.2688 | 21.2567 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 1907.6542 | 48.7452 | -40.9775 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3137.2281 | 122.5175 | -65.4074 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 606.083 | 3.2964 | -3.249 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1581.005 | -11.8128 | 51.421 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2039.3715 | -147.0882 | 57.4953 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 1027.34 | 201] 1.5 [DL + LL] | 244.1912 | 0.1524 | -137.2242 | 18.5891 | 137.2242 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 601.1798 | -2.9594 | 2.783 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3134.9875 | 157.1953 | -74.0168 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1636.1515 | -27.7507 | 27.2573 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 422.4888 | 15.0198 | 21.4067 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1557.8522 | 6.7494 | -43.084 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1975.6078 | -124.4096 | 48.6497 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 891.46 | 201] 1.5 [DL + LL] | 246.5251 | -0.2237 | 121.5331 | 18.5891 | 121.5331 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1599.5129 | -0.9191 | -1.8041 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 238.1358 | -14.3061 | 10.5878 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2037.7157 | -27.2269 | -33.274 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3399.6085 | 92.8679 | -64.1927 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 609.6444 | -1.5269 | 0.6646 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1706.2583 | 2.7128 | 32.7462 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 1857.4896 | 207.5114 | 61.5979 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 870.58 | 201] 1.5 [DL + LL] | 370.9188 | 1.3256 | -119.122 | 18.5891 | 119.122 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 605.643 | 0.8295 | -0.4657 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3374.4839 | 93.0202 | -68.7324 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1752.4102 | 19.2334 | 34.3168 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 235.1002 | -14.1908 | 11.1538 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1678.8608 | -6.8767 | -24.7516 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1831.0275 | 183.2202 | 52.3634 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 756.35 | 201] 1.5 [DL + LL] | 355.3541 | -0.9916 | 105.9309 | 18.5891 | 105.9309 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1718.5675 | -3.4171 | -1.515 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.301 | 201] 1.5 [DL + LL] | 22818.564 | 775.7937 | -396.2775 |
| Bottom | 0.31 | 201] 1.5 [DL + LL] | 23465.698 | 810.0461 | -356.3338 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 454.6616 | 14.6816 | 21.2173 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2053.9938 | 48.6974 | -39.4233 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3400.1453 | 112.4907 | -60.0464 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 659.7486 | 3.2214 | -3.3022 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1713.0599 | -11.686 | 50.3348 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2193.4547 | -139.1637 | 54.7021 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 975.62 | 201] 1.5 [DL + LL] | 275.0052 | 0.2475 | -131.2521 | 18.5891 | 131.2521 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 653.8683 | -2.9714 | 2.8704 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3395.1736 | 149.9443 | -69.5157 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1760.5378 | -27.9454 | 25.4426 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 442.3276 | 14.4439 | 21.3408 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1686.8384 | 6.2241 | -42.5698 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2125.9442 | -118.4282 | 46.5545 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 853.01 | 201] 1.5 [DL + LL] | 275.4587 | -0.3248 | 117.0929 | 18.5891 | 117.0929 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1728.3464 | -1.1741 | -1.7762 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 267.2449 | -13.6416 | 9.8262 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2178.7851 | -25.7117 | -31.2058 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3658.1418 | 86.4454 | -59.4189 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 661.8522 | -1.3064 | 0.9361 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1836.2353 | 2.0625 | 29.8555 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2024.8758 | 197.1406 | 59.1393 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 809.6 | 201] 1.5 [DL + LL] | 393.6506 | 1.2951 | -112.0801 | 18.5891 | 112.0801 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 657.1198 | 0.6594 | -0.6584 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3630.6846 | 88.2646 | -64.3007 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1872.7848 | 18.3124 | 33.0141 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 262.9604 | -13.5436 | 10.4112 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1806.0886 | -6.7472 | -22.467 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 1991.2889 | 175.1675 | 50.5944 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 707.48 | 201] 1.5 [DL + LL] | 378.1164 | -0.9838 | 100.2882 | 18.5891 | 100.2882 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1845.8691 | -3.6505 | -1.4849 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.323 | 201] 1.5 [DL + LL] | 24487.013 | 721.992 | -428.5925 |
| Bottom | 0.332 | 201] 1.5 [DL + LL] | 25134.1469 | 756.7035 | -393.5055 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 474.6348 | 14.0281 | 21.1544 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2199.783 | 48.4805 | -37.6079 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3658.5238 | 104.8496 | -55.0859 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 712.0357 | 3.1392 | -3.3472 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1842.8414 | -11.6198 | 48.7782 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2344.0737 | -130.2553 | 51.653 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 922.42 | 201] 1.5 [DL + LL] | 305.1578 | 0.3479 | -125.1089 | 18.5891 | 125.1089 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 705.4623 | -2.9681 | 2.9378 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3651.3121 | 144.2634 | -65.1119 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1884.607 | -27.9109 | 23.3512 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 461.8119 | 13.8022 | 21.2519 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1813.8158 | 5.7709 | -41.5938 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2273.4541 | -111.5283 | 44.1841 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 811.9 | 201] 1.5 [DL + LL] | 304.0262 | -0.4275 | 112.3462 | 18.5891 | 112.3462 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1855.4736 | -1.4195 | -1.7692 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 296.5211 | -12.9185 | 8.9914 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2318.8321 | -24.0071 | -28.8158 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3911.7842 | 81.9461 | -54.9618 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 712.6362 | -1.0875 | 1.204 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1963.9942 | 1.2662 | 26.755 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2189.3172 | 186.9843 | 56.4634 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 746.72 | 201] 1.5 [DL + LL] | 415.5777 | 1.2641 | -104.8186 | 18.5891 | 104.8186 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 707.367 | 0.4799 | -0.8548 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3882.4483 | 85.0499 | -59.9303 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 1992.4006 | 17.309 | 31.3792 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 291.1057 | -12.8395 | 9.5893 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1931.346 | -6.4563 | -19.973 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2149.4449 | 166.9603 | 48.5816 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 655.74 | 201] 1.5 [DL + LL] | 400.2034 | -0.9758 | 94.3124 | 18.5891 | 94.3124 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1971.1684 | -3.8723 | -1.4734 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.344 | 201] 1.5 [DL + LL] | 26127.3842 | 681.4687 | -456.7371 |
| Bottom | 0.353 | 201] 1.5 [DL + LL] | 26774.5181 | 716.8474 | -426.2593 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 494.0231 | 13.3102 | 21.0549 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2344.5128 | 48.1559 | -35.6908 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 3912.0191 | 99.1898 | -50.3841 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 762.9341 | 3.0503 | -3.3879 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 1970.394 | -11.6454 | 47.0367 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2491.3165 | -120.4542 | 48.4966 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 867.44 | 201] 1.5 [DL + LL] | 334.7509 | 0.4551 | -118.7594 | 18.5891 | 118.7594 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 755.8615 | -2.959 | 2.9977 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 3902.9879 | 140.0925 | -60.8341 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2007.9533 | -27.7117 | 21.128 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 480.8004 | 13.0945 | 21.1287 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 1938.8077 | 5.4196 | -40.4346 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2418.126 | -103.8074 | 41.6944 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 768.02 | 201] 1.5 [DL + LL] | 332.2981 | -0.5353 | 107.2784 | 18.5891 | 107.2784 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 1980.5988 | -1.6464 | -1.7784 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 325.9791 | -12.1375 | 8.07 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2457.4482 | -22.246 | -26.2555 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4160.1699 | 78.948 | -50.7148 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 762.0791 | -0.8709 | 1.4688 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2089.3873 | 0.2659 | 23.6976 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2350.9123 | 177.0858 | 53.7302 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 681.53 | 201] 1.5 [DL + LL] | 436.6424 | 1.2328 | -97.2905 | 18.5891 | 97.2905 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 756.4311 | 0.2988 | -1.0482 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4129.312 | 82.973 | -55.668 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2110.932 | 16.3246 | 29.5555 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 319.5422 | -12.0767 | 8.6788 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2054.4605 | -5.9412 | -17.5136 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2305.4914 | 158.7119 | 46.5024 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 600.84 | 201] 1.5 [DL + LL] | 421.5353 | -0.9657 | 87.9736 | 18.5891 | 87.9736 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2094.1951 | -4.0853 | -1.4924 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.366 | 201] 1.5 [DL + LL] | 27737.515 | 652.2687 | -481.1571 |
| Bottom | 0.374 | 201] 1.5 [DL + LL] | 28384.6489 | 689.9494 | -455.179 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 512.8036 | 12.5283 | 20.9169 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2487.8274 | 47.6144 | -33.6609 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4160.2853 | 95.0633 | -45.868 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 812.5318 | 2.9399 | -3.4111 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2095.569 | -11.9107 | 45.5693 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2635.1425 | -109.6356 | 45.4908 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 810.42 | 201] 1.5 [DL + LL] | 363.7545 | 0.5677 | -112.1745 | 18.5891 | 112.1745 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 805.1276 | -2.9434 | 3.0487 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4149.7515 | 137.0164 | -56.7778 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2130.2788 | -27.2659 | 18.7406 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 499.2789 | 12.3188 | 20.9722 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2061.6405 | 5.3221 | -39.5467 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2559.8498 | -95.1245 | 39.3699 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 721.28 | 201] 1.5 [DL + LL] | 360.2152 | -0.6502 | 101.8814 | 18.5891 | 101.8814 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2103.4586 | -1.856 | -1.8176 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 355.6291 | -11.3078 | 7.0618 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2594.2538 | -20.3785 | -23.4498 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4403.8009 | 77.0982 | -46.6888 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 810.343 | -0.676 | 1.707 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2211.8728 | -0.725 | 21.8462 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2509.0873 | 167.5443 | 51.2039 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 614.21 | 201] 1.5 [DL + LL] | 456.6233 | 1.1925 | -89.5174 | 18.5891 | 89.5174 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 804.488 | 0.1503 | -1.2044 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4371.6182 | 81.3952 | -51.614 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2228.0462 | 15.252 | 27.4079 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 348.2632 | -11.2625 | 7.6809 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2174.8647 | -5.4038 | -16.2464 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2458.7963 | 150.6233 | 44.6358 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 543.19 | 201] 1.5 [DL + LL] | 441.8516 | -0.9421 | 81.3153 | 18.5891 | 81.3153 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2215.1105 | -4.3025 | -1.5691 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.386 | 201] 1.5 [DL + LL] | 29315.1303 | 634.0418 | -502.3552 |
| Bottom | 0.395 | 201] 1.5 [DL + LL] | 29962.2642 | 674.2687 | -480.6695 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 530.9315 | 11.6569 | 20.781 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2629.3712 | 46.8538 | -30.8034 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4403.9915 | 92.176 | -41.6648 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 861.0188 | 2.7528 | -3.3389 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2217.7803 | -12.5105 | 45.9886 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2774.761 | -97.7233 | 42.7099 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 750.34 | 201] 1.5 [DL + LL] | 391.9463 | 0.6557 | -105.2369 | 18.5891 | 105.2369 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 853.4735 | -2.8693 | 3.017 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4392.1005 | 134.4494 | -53.2543 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2251.2559 | -26.6271 | 15.5896 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 517.2001 | 11.4475 | 20.8285 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2181.6953 | 5.5802 | -40.5329 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2697.806 | -85.3351 | 37.1472 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 670.72 | 201] 1.5 [DL + LL] | 387.5147 | -0.744 | 96.0426 | 18.5891 | 96.0426 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2224.2837 | -2.0567 | -1.9113 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 384.662 | -10.4145 | 6.1265 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2729.2645 | -17.3321 | -19.9693 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4645.8666 | 76.4369 | -43.0466 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 857.8537 | -0.496 | 1.8804 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2330.4412 | -0.094 | 23.0448 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2660.5084 | 156.8834 | 49.0386 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 547.66 | 201] 1.5 [DL + LL] | 475.4686 | 1.0708 | -81.8325 | 18.5891 | 81.8325 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 852.0335 | 0.0333 | -1.2765 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4612.4357 | 80.0131 | -47.7654 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2343.6998 | 13.1714 | 24.4783 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 376.4626 | -10.3829 | 6.7395 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2291.2951 | -6.5222 | -18.0813 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2606.0584 | 141.0089 | 42.9524 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 485.84 | 201] 1.5 [DL + LL] | 461.1328 | -0.8269 | 74.6931 | 18.5891 | 74.6931 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2335.0812 | -4.5272 | -1.7173 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.398 | 201] 1.5 [DL + LL] | 30857.8479 | 625.3251 | -520.6138 |
| Bottom | 0.407 | 201] 1.5 [DL + LL] | 31504.9819 | 663.2844 | -503.2043 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 547.4904 | 10.6815 | 20.5619 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2769.2433 | 46.8731 | -26.4727 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4646.4581 | 90.6207 | -37.8263 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 908.8492 | 2.4482 | -3.0762 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2335.9886 | -12.0082 | 48.2724 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2906.6225 | -86.1624 | 39.5134 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 682.52 | 201] 1.5 [DL + LL] | 419.29 | 0.5923 | -97.4055 | 18.5891 | 97.4055 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 901.4294 | -2.7076 | 2.8221 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4633.2504 | 132.1129 | -50.1964 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2370.8973 | -26.652 | 11.3197 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 533.6774 | 10.4669 | 20.6208 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2297.6448 | 4.6973 | -43.509 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2828.5031 | -76.1056 | 33.7606 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 611.37 | 201] 1.5 [DL + LL] | 414.2041 | -0.6779 | 89.1885 | 18.5891 | 89.1885 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2344.2992 | -2.248 | -2.0635 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 411.7672 | -9.3682 | 5.8047 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2862.6127 | -12.4791 | -16.2848 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4888.1394 | 76.839 | -39.7038 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 904.6647 | -0.2569 | 2.0065 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2446.5789 | 3.4241 | 23.0741 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2800.6149 | 143.2792 | 46.2073 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 483.15 | 201] 1.5 [DL + LL] | 494.2815 | 0.947 | -74.3822 | 18.5891 | 74.3822 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 899.1097 | -0.0653 | -1.2434 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4853.9016 | 79.6675 | -43.3593 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2457.6853 | 9.9641 | 21.3222 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 403.0699 | -9.3415 | 6.3941 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2404.8288 | -10.9293 | -19.0467 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2741.8869 | 126.6136 | 39.9423 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 429.8 | 201] 1.5 [DL + LL] | 481.2785 | -0.7127 | 68.2212 | 18.5891 | 68.2212 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2454.5618 | -4.6712 | -1.7954 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.418 | 201] 1.5 [DL + LL] | 32363.8824 | 621.1742 | -536.493 |
| Bottom | 0.426 | 201] 1.5 [DL + LL] | 33011.0163 | 661.531 | -527.8737 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 561.6198 | 9.8368 | 19.4631 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2907.6347 | 48.6538 | -23.8702 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 4888.534 | 90.0013 | -33.8214 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 955.8908 | 2.2293 | -2.8032 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2451.9401 | -7.4957 | 42.0004 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3026.5439 | -75.9486 | 35.1239 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 607.82 | 201] 1.5 [DL + LL] | 447.3188 | 0.672 | -88.7793 | 18.5891 | 88.7793 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 948.7625 | -2.6216 | 2.5694 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 4874.5227 | 130.6002 | -45.5396 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2488.9857 | -27.7043 | 7.5585 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 548.1068 | 9.5769 | 19.6384 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2410.9102 | -0.5216 | -38.2854 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2946.8852 | -70.1245 | 31.4164 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 546.15 | 201] 1.5 [DL + LL] | 442.5682 | -0.8203 | 81.6578 | 18.5891 | 81.6578 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2463.659 | -2.3596 | -2.1178 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 441.4235 | -8.3559 | 4.8701 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 2989.1138 | -9.6677 | -13.3598 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5116.3274 | 76.7324 | -36.3694 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 948.3889 | 0.4233 | 2.5297 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2564.1332 | 1.4451 | 7.2159 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 2950.4526 | 125.8961 | 40.7811 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 506.4704 | 0.8375 | -64.3092 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 942.3334 | -0.7582 | -1.6627 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5082.9864 | 83.3025 | -37.9711 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2566.4718 | 7.5915 | 18.6809 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 431.0064 | -8.3958 | 5.6528 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2522.5057 | -9.0234 | -3.1224 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 2884.7107 | 110.8986 | 36.6854 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 495.3052 | -0.3174 | 59.4547 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2569.3869 | -4.609 | -1.362 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.437 | 201] 1.5 [DL + LL] | 33844.4729 | 633.4494 | -551.5645 |
| Bottom | 0.445 | 201] 1.5 [DL + LL] | 34491.6068 | 662.0981 | -537.1697 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 577.4323 | 9.0249 | 18.6936 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3041.1504 | 46.1217 | -19.4966 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5115.2927 | 88.9361 | -30.8167 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1000.1615 | 2.3324 | -3.355 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2570.1109 | -6.6119 | 25.3604 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3155.5849 | -58.2175 | 27.7126 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 520.21 | 201] 1.5 [DL + LL] | 473.6313 | 0.4371 | -78.6624 | 18.5891 | 78.6624 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 992.3569 | -3.2211 | 3.4875 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5102.0937 | 133.0287 | -39.8132 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2603.6687 | -25.9712 | 3.0524 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 564.3698 | 8.7702 | 18.9888 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2527.7813 | -2.7448 | -20.318 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3075.5224 | -56.0084 | 29.4842 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 473.72 | 201] 1.5 [DL + LL] | 467.4182 | -1.0306 | 73.2931 | 18.5891 | 73.2931 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2577.8979 | -2.3742 | -1.645 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 464.6158 | -8.8388 | 2.2211 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3118.6182 | -18.0344 | -20.9818 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5322.4109 | 76.017 | -34.474 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 990.6504 | 0.218 | 3.0397 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2675.5379 | -8.3315 | -2.6932 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3112.0761 | 130.3139 | 33.3351 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 527.9381 | 0.8143 | -60.2215 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 982.7468 | -0.0663 | -1.8622 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5289.1454 | 89.8809 | -35.828 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2681.3691 | 14.3309 | 27.034 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 452.5686 | -8.7249 | 3.2186 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2636.8751 | 2.6429 | 7.7259 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3046.0699 | 125.4295 | 34.7115 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 512.8659 | -0.2036 | 56.1521 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2678.1185 | -4.552 | -0.496 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.456 | 201] 1.5 [DL + LL] | 35324.573 | 639.1127 | -556.5826 |
| Bottom | 0.465 | 201] 1.5 [DL + LL] | 35971.7069 | 683.45 | -531.719 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 607.2731 | 9.4005 | 21.1338 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3165.8698 | 39.0542 | -19.6295 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5321.7968 | 87.6856 | -30.5932 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1041.5766 | 2.1386 | -3.5802 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2681.2462 | -17.0156 | 42.3456 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3313.687 | -53.3668 | 31.3507 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 549.65 | 201] 1.5 [DL + LL] | 496.3926 | 0.6896 | -82.0618 | 18.5891 | 82.0618 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1032.0303 | -2.8024 | 3.6742 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5308.4028 | 138.662 | -39.718 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2713.9649 | -20.1681 | 4.5321 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 592.4649 | 9.2249 | 21.1261 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2641.9231 | 9.3787 | -36.6681 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3235.0196 | -42.769 | 27.5225 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 507.75 | 201] 1.5 [DL + LL] | 486.103 | -1.2659 | 77.2237 | 18.5891 | 77.2237 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2686.8223 | -2.5044 | -0.875 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 488.0375 | -8.2553 | 3.0422 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3248.3434 | -10.508 | -10.3079 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5554.3861 | 78.5221 | -34.4971 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1032.8944 | 1.0559 | 3.6871 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2790.3576 | -1.9024 | 14.2025 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3238.9637 | 122.7648 | 38.2951 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 549.4326 | 1.2052 | -56.7497 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1024.4614 | -0.8733 | -2.605 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5520.8022 | 94.7476 | -38.1329 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2794.5881 | 9.5844 | 18.919 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 477.0024 | -8.2375 | 3.7915 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2751.8205 | -3.6056 | -8.7625 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3172.5004 | 116.6721 | 34.0356 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 535.0732 | -0.6512 | 52.9726 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2793.0433 | -4.4471 | -0.0612 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.419 | 201] 1.5 [DL + LL] | 36782.3614 | 655.8203 | -548.1883 |
| Bottom | 0.426 | 201] 1.5 [DL + LL] | 37429.4953 | 695.5848 | -526.297 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 623.5877 | 8.9198 | 19.6826 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3296.1039 | 43.535 | -19.4727 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5555.4336 | 90.4067 | -29.9095 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1083.8976 | 2.6401 | -3.7841 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2795.6953 | -12.8134 | 45.8441 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3430.5006 | -50.2015 | 31.0244 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 506.17 | 201] 1.5 [DL + LL] | 521.3495 | 0.8993 | -77.0405 | 18.5891 | 77.0405 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1074.0094 | -3.1256 | 3.7369 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5541.495 | 143.5233 | -40.3982 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2827.7337 | -22.5537 | 3.9386 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 609.7105 | 8.7597 | 19.6095 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2756.3397 | 5.2621 | -40.2469 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3352.8679 | -41.6736 | 27.238 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 467.45 | 201] 1.5 [DL + LL] | 511.3929 | -1.3816 | 72.5691 | 18.5891 | 72.5691 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2802.244 | -2.4915 | -0.5098 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 512.3544 | -7.5842 | 2.5277 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3376.6304 | -7.9598 | -11.2033 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5779.932 | 79.6461 | -33.5425 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1076.9731 | 0.8238 | 3.3737 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2898.5414 | -0.5256 | 9.672 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3370.1003 | 114.8666 | 36.6944 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 567.7066 | 0.87 | -52.9074 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1068.5876 | -0.7817 | -2.3902 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5746.4532 | 96.0564 | -37.4023 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2906.9379 | 8.5393 | 19.6149 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 501.8412 | -7.578 | 3.2334 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2859.6136 | -5.1576 | -4.6268 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3303.8678 | 108.4051 | 32.6242 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 554.267 | -0.3644 | 49.6478 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2905.6887 | -4.4274 | -0.1047 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.435 | 201] 1.5 [DL + LL] | 38215.5944 | 663.0826 | -539.7816 |
| Bottom | 0.443 | 201] 1.5 [DL + LL] | 38862.7283 | 703.9003 | -523.5585 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 640.4636 | 8.3851 | 19.2269 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3425.3147 | 43.675 | -18.2577 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5780.6991 | 90.8573 | -28.1859 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1127.6715 | 2.4391 | -3.6872 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 2903.6866 | -10.0985 | 40.1213 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3551.8068 | -44.5783 | 28.2014 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 464.72 | 201] 1.5 [DL + LL] | 544.2054 | 0.846 | -72.2537 | 18.5891 | 72.2537 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1117.9291 | -2.9265 | 3.5805 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5766.6801 | 143.9628 | -39.2813 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 2940.9717 | -21.7131 | 1.7776 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 627.0845 | 8.2166 | 19.1497 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2864.0259 | 2.5725 | -35.2023 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3475.7369 | -38.0066 | 25.4359 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 430.06 | 201] 1.5 [DL + LL] | 534.628 | -1.2802 | 68.2522 | 18.5891 | 68.2522 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 2914.6905 | -2.4378 | -0.5964 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 537.7281 | -6.9669 | 1.6507 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3501.4019 | -5.8166 | -9.7529 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5996.6352 | 80.1857 | -32.0149 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1119.4236 | 0.9106 | 3.4696 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3006.0705 | -1.488 | 4.2094 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3504.3549 | 109.3384 | 34.1522 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 586.1195 | 0.7949 | -47.9914 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1111.1174 | -0.8887 | -2.4896 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5963.9692 | 97.5725 | -35.3541 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3015.871 | 7.3178 | 18.0126 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 527.2535 | -6.9626 | 2.33 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2967.1638 | -4.2934 | 0.0292 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3438.2591 | 103.5167 | 31.0222 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 573.1147 | -0.3177 | 45.3041 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3014.2457 | -4.4812 | -0.4519 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.451 | 201] 1.5 [DL + LL] | 39622.6895 | 664.8139 | -533.9866 |
| Bottom | 0.459 | 201] 1.5 [DL + LL] | 40269.8234 | 706.9426 | -522.974 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 657.7252 | 7.7253 | 19.0579 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3551.0037 | 43.1173 | -16.6991 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 5997.303 | 90.8473 | -26.5145 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1169.9166 | 2.4131 | -3.7351 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3011.0062 | -9.8448 | 36.8427 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3675.771 | -36.1125 | 25.4554 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 427.27 | 201] 1.5 [DL + LL] | 567.2495 | 0.941 | -67.9297 | 18.5891 | 67.9297 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1160.3198 | -2.8422 | 3.5516 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 5983.852 | 144.5181 | -37.5557 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3050.7729 | -20.8137 | -0.3343 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 644.4443 | 7.5454 | 18.9659 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 2971.4534 | 2.4955 | -32.8024 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3601.1056 | -30.6026 | 23.3479 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 557.606 | -1.3285 | 64.3995 | 18.5891 | 64.7804 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3023.1605 | -2.3795 | -0.9642 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 563.0503 | -6.2438 | 0.839 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3623.0848 | -3.8634 | -7.5392 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6207.8358 | 80.3862 | -30.7013 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1160.6884 | 1.0328 | 3.6176 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3112.5868 | -2.4672 | 1.1755 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3638.0657 | 103.3753 | 31.6998 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 604.3195 | 0.7558 | -42.7364 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1152.4426 | -1.0508 | -2.6683 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6176.0994 | 98.7845 | -33.6182 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3121.8424 | 6.3235 | 16.0808 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 552.5422 | -6.2432 | 1.4792 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3073.7719 | -3.4369 | 2.1557 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3571.6975 | 98.3552 | 29.1634 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 591.6233 | -0.3148 | 40.5869 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3120.1727 | -4.5606 | -0.8571 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.467 | 201] 1.5 [DL + LL] | 41001.5608 | 659.0195 | -530.3321 |
| Bottom | 0.474 | 201] 1.5 [DL + LL] | 41648.6947 | 705.7162 | -524.5268 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 674.1543 | 7.0251 | 18.7843 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3673.5874 | 42.0577 | -15.0165 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6208.6677 | 90.5377 | -24.9097 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1211.028 | 2.3821 | -3.8075 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3117.2279 | -10.1002 | 35.6063 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3798.4972 | -27.5607 | 23.1805 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 590.2393 | 1.0597 | -63.4588 | 18.5891 | 64.7804 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1201.5711 | -2.7771 | 3.5606 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6195.8448 | 144.7048 | -35.8971 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3157.627 | -19.4687 | -2.6217 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 660.9377 | 6.8374 | 18.675 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3077.8289 | 2.9039 | -32.4361 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3724.8108 | -22.9272 | 21.523 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 580.4312 | -1.403 | 60.4106 | 18.5891 | 64.7804 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3129.1076 | -2.3361 | -1.3757 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 588.258 | -5.4557 | 0.0032 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3741.6673 | -1.9341 | -5.2803 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6414.8524 | 80.1926 | -29.1716 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1201.1347 | 1.1686 | 3.7853 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3217.069 | -3.1027 | -0.713 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3769.4372 | 96.7998 | 29.625 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 622.0776 | 0.7032 | -37.3166 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1193.0473 | -1.2133 | -2.8512 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6384.2791 | 99.2294 | -31.9655 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3224.8706 | 5.1459 | 13.9343 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 577.5999 | -5.4613 | 0.6048 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3178.2566 | -3.0275 | 3.1876 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3702.4423 | 92.4399 | 27.5255 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 609.6656 | -0.3004 | 35.6979 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3224.0371 | -4.6404 | -1.0644 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.417 | 201] 1.5 [DL + LL] | 42349.8465 | 646.1373 | -528.8248 |
| Bottom | 0.424 | 201] 1.5 [DL + LL] | 42996.9804 | 703.5048 | -526.4905 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 689.6693 | 6.2582 | 18.4107 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3792.9519 | 40.6445 | -13.0958 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6415.978 | 89.7548 | -22.6674 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1251.3099 | 2.3259 | -3.849 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3221.3733 | -10.2154 | 35.0394 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3918.3026 | -18.9467 | 20.9346 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 612.9651 | 1.1603 | -58.6514 | 18.5891 | 64.7804 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1242.1172 | -2.6879 | 3.5274 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6403.9904 | 144.0028 | -33.9175 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3261.4655 | -18.0391 | -5.1375 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 676.4144 | 6.0625 | 18.2913 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3182.0349 | 3.0276 | -32.509 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3845.2391 | -15.2982 | 19.4763 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 602.992 | -1.4574 | 56.0741 | 18.5891 | 64.7804 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3233.0431 | -2.342 | -1.5542 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 613.1997 | -4.6354 | -0.9844 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3857.6135 | 0.4959 | -2.9953 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6617.12 | 80.4936 | -26.6298 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1240.7723 | 1.3164 | 3.9473 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3318.9448 | -3.4071 | -2.5949 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 3897.6616 | 89.5473 | 27.6609 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 639.4255 | 0.6178 | -31.7708 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1233.0515 | -1.4046 | -3.0141 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6588.692 | 99.9686 | -29.3369 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3325.4267 | 3.0591 | 11.5574 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 602.1901 | -4.651 | -0.4184 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3280.2324 | -3.1467 | 4.5446 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3829.8207 | 85.4248 | 25.7878 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 627.4354 | -0.2534 | 30.6924 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3325.3941 | -4.6113 | -0.6089 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.43 | 201] 1.5 [DL + LL] | 43664.8184 | 628.7519 | -527.7665 |
| Bottom | 0.437 | 201] 1.5 [DL + LL] | 44311.9523 | 707.1222 | -522.4608 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 704.1224 | 5.3883 | 18.0282 | 18.5891 | 64.7804 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3909.4471 | 39.3886 | -11.8668 | 639.36 | 916.5078 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6618.5151 | 89.1601 | -18.7035 | 1512 | 1997.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1290.6722 | 2.2505 | -3.8709 | 48.4085 | 140.7911 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3322.8646 | -9.8661 | 33.3557 | 378 | 620.5043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4034.4719 | -10.1205 | 17.9419 | 782.3077 | 1071.0033 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 635.5217 | 1.2347 | -53.4213 | 18.5891 | 64.7804 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1281.9809 | -2.6467 | 3.4923 | 48.4085 | 140.7911 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6608.344 | 143.2435 | -30.476 | 1512 | 1997.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3362.6947 | -17.2734 | -6.7667 | 378 | 620.5043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 690.6321 | 5.1825 | 17.8954 | 18.5891 | 64.7804 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3283.7068 | 2.3445 | -30.6795 | 378 | 620.5043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3961.8341 | -7.8025 | 16.2802 | 782.3077 | 1071.0033 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 625.5699 | -1.4893 | 51.2867 | 18.5891 | 64.7804 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3334.441 | -2.3971 | -1.0042 | 378 | 620.5043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 638.417 | -3.8749 | -2.6641 | 18.5891 | 64.7804 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 3972.8029 | 3.5984 | -0.8972 | 639.36 | 916.5078 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6809.1387 | 82.7376 | -22.549 | 1512 | 1997.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1280.2776 | 1.47 | 4.1178 | 48.4085 | 140.7911 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3416.8109 | -4.9217 | -6.2803 | 378 | 620.5043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4024.6123 | 82.5379 | 25.4393 | 782.3077 | 1071.0033 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 656.7876 | 0.6045 | -25.4013 | 18.5891 | 64.7804 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1273.0377 | -1.5777 | -3.119 | 48.4085 | 140.7911 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6784.9513 | 104.0863 | -24.1206 | 1512 | 1997.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3425.554 | -0.337 | 9.5174 | 378 | 620.5043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 626.8825 | -3.9144 | -2.1388 | 18.5891 | 64.7804 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3379.0713 | -2.1162 | 8.9015 | 378 | 620.5043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 3956.4106 | 78.1034 | 23.4454 | 782.3077 | 1071.0033 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 645.5929 | -0.268 | 24.9082 | 18.5891 | 64.7804 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3421.605 | -4.2543 | 1.062 | 378 | 620.5043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.443 | 201] 1.5 [DL + LL] | 44943.496 | 612.7708 | -520.9808 |
| Bottom | 0.45 | 201] 1.5 [DL + LL] | 45611.1739 | 729.4838 | -496.4819 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 718.2352 | 4.3319 | 17.7958 | 18.4421 | 64.6334 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4024.4663 | 37.9293 | -9.4872 | 574.3059 | 851.4537 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6810.9814 | 90.2834 | -12.7275 | 1496 | 1981.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1329.5627 | 2.1957 | -3.9279 | 47.6082 | 139.9908 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3420.4411 | -10.5829 | 30.8023 | 351.7043 | 594.2087 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4149.3106 | -0.8994 | 14.3454 | 690 | 978.6957 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 657.9032 | 1.2795 | -46.8631 | 18.4421 | 64.6334 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1321.5151 | -2.7288 | 3.5819 | 47.6082 | 139.9908 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6804.4579 | 145.1619 | -24.8272 | 1496 | 1981.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3463.0868 | -17.3389 | -8.3083 | 351.7043 | 594.2087 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 704.3453 | 4.0929 | 17.6425 | 18.4421 | 64.6334 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3382.4168 | 2.2822 | -25.9962 | 351.7043 | 594.2087 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4077.6574 | -0.2741 | 12.7504 | 690 | 978.6957 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 648.4635 | -1.5308 | 45.2468 | 18.4421 | 64.6334 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3430.6527 | -2.4257 | 0.8243 | 351.7043 | 594.2087 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 664.6324 | -3.1649 | -5.6214 | 18.4421 | 64.6334 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4089.6736 | 9.6897 | 2.2091 | 574.3059 | 851.4537 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6988.5673 | 89.5116 | -19.7816 | 1496 | 1981.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1321.8479 | 1.9888 | 4.4444 | 47.6082 | 139.9908 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3509.1664 | -10.3766 | -10.0511 | 351.7043 | 594.2087 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4152.9525 | 81.467 | 22.5124 | 690 | 978.6957 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 676.5126 | 0.957 | -17.1459 | 18.4421 | 64.6334 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1314.7385 | -1.9488 | -3.2859 | 47.6082 | 139.9908 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6970.6311 | 116.6309 | -17.4922 | 1496 | 1981.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3528.0512 | -7.0196 | 5.8988 | 351.7043 | 594.2087 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 652.9448 | -3.1266 | -5.2405 | 18.4421 | 64.6334 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3473.6306 | 3.6486 | 13.7496 | 351.7043 | 594.2087 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4088.8453 | 78.2346 | 20.5679 | 690 | 978.6957 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 665.533 | -0.6431 | 17.073 | 18.4421 | 64.6334 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3513.4466 | -3.4056 | 3.6938 | 351.7043 | 594.2087 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.455 | 201] 1.5 [DL + LL] | 46200.5545 | 613.2109 | -505.078 |
| Bottom | 0.464 | 201] 1.5 [DL + LL] | 47063.3997 | 710.1958 | -425.9553 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 732.8477 | 3.1759 | 19.3689 | 17.4316 | 63.6229 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4140.6762 | 39.7888 | -5.2117 | 316.8 | 593.9478 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 6990.1485 | 97.327 | -12.4243 | 1344 | 1829.0087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1370.8846 | 2.89 | -4.6252 | 42.3529 | 134.7355 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3511.8185 | -15.7893 | 37.4943 | 226.8 | 469.3043 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4264.7104 | 16.077 | 5.6795 | 354.7059 | 643.4015 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 683.6593 | 2.495 | -45.0194 | 17.4316 | 63.6229 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1363.1477 | -3.4568 | 4.241 | 42.3529 | 134.7355 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 6989.8149 | 157.6112 | -24.4382 | 1344 | 1829.0087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3566.3906 | -20.2619 | -9.909 | 226.8 | 469.3043 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 716.7847 | 2.8977 | 18.8782 | 17.4316 | 63.6229 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3476.4251 | 7.5881 | -31.2338 | 226.8 | 469.3043 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4196.0956 | 15.5619 | 3.4172 | 354.7059 | 643.4015 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 674.1811 | -2.6691 | 43.7508 | 17.4316 | 63.6229 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3522.9696 | -2.2021 | 3.5361 | 226.8 | 469.3043 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 689.2354 | -1.7454 | -9.5208 | 17.4316 | 63.6229 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4210.124 | 35.3894 | 9.6694 | 316.8 | 593.9478 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7206.4277 | 95.7248 | -30.1081 | 1344 | 1829.0087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1368.5963 | 2.9536 | 5.3726 | 42.3529 | 134.7355 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3611.5086 | -10.5102 | -15.8515 | 226.8 | 469.3043 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4294.7263 | 64.7563 | 13.3579 | 354.7059 | 643.4015 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 691.364 | 0.1426 | -7.0411 | 17.4316 | 63.6229 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1361.7351 | -2.56 | -4.0003 | 42.3529 | 134.7355 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7191.2983 | 129.3533 | -19.6991 | 1344 | 1829.0087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3636.2295 | -22.8549 | 6.7006 | 226.8 | 469.3043 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 680.4173 | -1.9273 | -8.6599 | 17.4316 | 63.6229 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3580.0181 | 6.2294 | 23.0055 | 226.8 | 469.3043 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4239.1106 | 64.2573 | 11.0995 | 354.7059 | 643.4015 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 681.7082 | 0.1175 | 7.4833 | 17.4316 | 63.6229 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3620.9002 | -2.5704 | 5.4429 | 226.8 | 469.3043 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.469 | 201] 1.5 [DL + LL] | 47601.9596 | 569.2421 | -407.9468 |
| Bottom | 0.477 | 201] 1.5 [DL + LL] | 48427.8257 | 400.532 | -342.4543 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 735.2389 | 0.9595 | 22.1652 | 17.5823 | 63.7736 |
| Top | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4267.586 | 60.0613 | -21.6981 | 342.4 | 619.5478 |
| Top | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7207.6985 | 103.5724 | -34.0282 | 1372.8 | 1857.8087 |
| Top | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1418.608 | 3.0286 | -4.4853 | 43.1106 | 135.4932 |
| Top | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3613.0036 | -14.3882 | 38.5987 | 240.975 | 483.4793 |
| Top | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4378.3578 | 31.276 | -7.9236 | 386.0526 | 674.7483 |
| Top | Leg 7 | 400 | 201] 1.5 [DL + LL] | 714.3541 | 2.2705 | -37.0251 | 17.5823 | 63.7736 |
| Top | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1410.881 | -3.3578 | 3.9497 | 43.1106 | 135.4932 |
| Top | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7210.5362 | 170.684 | -45.6183 | 1372.8 | 1857.8087 |
| Top | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3682.6735 | -28.6961 | 4.4393 | 240.975 | 483.4793 |
| Top | Leg 11 | 400 | 201] 1.5 [DL + LL] | 724.6126 | 0.8109 | 22.1677 | 17.5823 | 63.7736 |
| Top | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3581.5353 | 8.2765 | -31.7185 | 240.975 | 483.4793 |
| Top | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4322.4761 | 32.2123 | -10.668 | 386.0526 | 674.7483 |
| Top | Leg 14 | 400 | 201] 1.5 [DL + LL] | 705.3402 | -2.482 | 36.9247 | 17.5823 | 63.7736 |
| Top | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3629.0576 | -1.805 | 4.8912 | 240.975 | 483.4793 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 742.7856 | 0.5788 | -20.2318 | 17.5823 | 63.7736 |
| Bottom | Leg 2 | 400 | 201] 1.5 [DL + LL] | 4357.8398 | 69.7029 | 0.155 | 342.4 | 619.5478 |
| Bottom | Leg 3 | 400 | 201] 1.5 [DL + LL] | 7392.3743 | 64.1942 | -47.6777 | 1372.8 | 1857.8087 |
| Bottom | Leg 4 | 400 | 201] 1.5 [DL + LL] | 1497.9458 | 1.5732 | 0.7699 | 43.1106 | 135.4932 |
| Bottom | Leg 5 | 400 | 201] 1.5 [DL + LL] | 3607.6026 | -21.704 | -24.7681 | 240.975 | 483.4793 |
| Bottom | Leg 6 | 400 | 201] 1.5 [DL + LL] | 4434.8823 | 90.488 | 26.2485 | 386.0526 | 674.7483 |
| Bottom | Leg 7 | 400 | 201] 1.5 [DL + LL] | 730.716 | 0.669 | 20.8704 | 17.5823 | 63.7736 |
| Bottom | Leg 8 | 400 | 201] 1.5 [DL + LL] | 1487.9149 | -1.5787 | -0.6911 | 43.1106 | 135.4932 |
| Bottom | Leg 9 | 400 | 201] 1.5 [DL + LL] | 7395.9093 | 158.6163 | -23.442 | 1372.8 | 1857.8087 |
| Bottom | Leg 10 | 400 | 201] 1.5 [DL + LL] | 3759.5847 | -26.0588 | 23.4291 | 240.975 | 483.4793 |
| Bottom | Leg 11 | 400 | 201] 1.5 [DL + LL] | 737.0713 | 0.1324 | -20.076 | 17.5823 | 63.7736 |
| Bottom | Leg 12 | 400 | 201] 1.5 [DL + LL] | 3578.7163 | 20.3829 | 31.4902 | 240.975 | 483.4793 |
| Bottom | Leg 13 | 400 | 201] 1.5 [DL + LL] | 4388.3999 | 89.7615 | 23.1863 | 386.0526 | 674.7483 |
| Bottom | Leg 14 | 400 | 201] 1.5 [DL + LL] | 723.1275 | -0.6553 | -20.7046 | 17.5823 | 63.7736 |
| Bottom | Leg 15 | 400 | 201] 1.5 [DL + LL] | 3592.9554 | -1.6729 | 2.3467 | 240.975 | 483.4793 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 355.5817 | -31.7307 | -77.515 | 420000 |
| Bottom | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 424.3888 | 36.8861 | -137.4506 | 420000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 355.5817 | -77.515 | -13.6489 | 236.0428 | 478.5472 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 424.3888 | -137.4506 | -13.6489 | 236.0428 | 478.5472 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 1020.1684 | -27.0908 | 164.2178 | 420000 |
| Bottom | 1050 | 0.0025 | 0.0024 | 201] 1.5 [DL + LL] | 1066.6172 | -5.3681 | -376.7656 | 420000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1020.1684 | 164.2178 | -183.3489 | 492.0224 | 734.5267 |
| Bottom | Leg 1 | 400 | 201] 1.5 [DL + LL] | 1066.6172 | -376.7656 | -183.3489 | 492.0224 | 734.5267 |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Concrete Frame Design

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C1 | 32 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.736 |
| Bottom | 19636 | 4.01 | 0.74 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8003.6752 | -251.102 | -2.5907 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8047.9826 | 252.492 | 1.6063 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0073 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.0073 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.8799 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.8799 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C2 | 33 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.743 |
| Bottom | 15709 | 3.21 | 0.747 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7170.0276 | -224.9477 | 2.8558 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 7214.335 | 226.3377 | 4.6921 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6828 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.6828 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.186 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.186 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C3 | 34 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.735 |
| Bottom | 19636 | 4.01 | 0.739 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7989.624 | 250.6611 | 1.1105 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8033.9314 | 252.0512 | -1.2027 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2653 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.2653 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.2984 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.2984 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C4 | 35 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.727 |
| Bottom | 15709 | 3.21 | 0.731 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7020.6114 | 220.26 | 2.9035 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 7064.9188 | 221.6501 | 3.6162 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5662 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.5662 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2134 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.2134 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C5 | 36 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.72 |
| Bottom | 19636 | 4.01 | 0.723 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7824.5102 | -245.481 | -0.2389 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 7868.8176 | 246.871 | -2.3517 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5454 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5454 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.0996 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.0996 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C6 | 37 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.769 |
| Bottom | 15709 | 3.21 | 0.774 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7421.2163 | -232.8283 | 0.3852 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 7465.5237 | -234.2184 | -0.4169 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.2304 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.2304 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.1325 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.1325 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C7 | 38 | C5 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.738 |
| Bottom | 19636 | 4.01 | 0.742 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 8021.5818 | 251.6638 | 0.1842 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 8065.8892 | 253.0538 | 0.3391 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5183 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.5183 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.6096 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.6096 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C8 | 39 | C6 (0F-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.79 |
| Bottom | 15709 | 3.21 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7624.0386 | -239.1915 | -0.4319 | 2412 | 203] 1.5 [DL + RSY] |
| Bottom | 7668.346 | 240.5816 | -1.1896 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.752 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.752 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.3512 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.3512 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C9 | 40 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.741 |
| Bottom | 13745 | 2.29 | 0.742 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7582.0873 | 212.6017 | -65.0607 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 7672.5106 | 215.1372 | -112.1256 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.8121 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.8121 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.4819 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.4819 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C10 | 41 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.767 |
| Bottom | 13745 | 2.29 | 0.767 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7846.2736 | 220.0095 | -65.5197 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 7936.6969 | 222.545 | -114.7468 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 21.3719 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 21.3719 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.865 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.865 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C11 | 42 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.723 |
| Bottom | 13745 | 2.29 | 0.723 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7399.7766 | 207.4897 | -64.2457 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 7490.1999 | 210.0252 | -113.4999 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.8056 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.8056 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.6281 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.6281 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| GF(+0.25) | C12 | 43 | C11 (0-1F) | 4020 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.736 |
| Bottom | 13745 | 2.29 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7529.6178 | 211.1305 | -64.1693 | 4020 | 202] 1.5 [DL + RSX] |
| Bottom | 7583.8718 | 212.6518 | -96.3076 | 1608 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 21.4905 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 21.4905 | 1608 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3597 | 4020 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.3597 | 1608 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C1 | 231 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.696 |
| Bottom | 19636 | 4.01 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7570.6776 | -240.2428 | -2.845 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7616.9689 | 241.7118 | 1.6436 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1382 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1382 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.604 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.604 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C2 | 232 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.735 |
| Bottom | 15709 | 3.21 | 0.74 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7094.198 | -225.1225 | 1.1663 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7140.4893 | 226.5915 | 1.7749 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6798 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.6798 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0197 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0197 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C3 | 233 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.69 |
| Bottom | 19636 | 4.01 | 0.695 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7505.9751 | -238.1896 | 1.5098 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7552.2664 | 239.6586 | -0.2737 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6505 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6505 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3721 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3721 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C4 | 234 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.719 |
| Bottom | 15709 | 3.21 | 0.724 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6944.7818 | -220.3811 | 2.9048 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 6991.0731 | 221.8501 | 2.6757 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5571 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.5571 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0534 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0534 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C5 | 235 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.687 |
| Bottom | 19636 | 4.01 | 0.69 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7470.3099 | -237.0578 | -1.8541 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7516.6012 | 238.5268 | 5.6182 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8896 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8896 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2973 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.2973 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C6 | 236 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.734 |
| Bottom | 15709 | 3.21 | 0.739 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7083.6336 | -224.7873 | -1.3832 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7129.9249 | 226.2563 | -1.5943 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.2678 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.2678 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2453 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2453 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C7 | 237 | C5 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 19636 | 4.01 | 0.702 |
| Bottom | 19636 | 4.01 | 0.705 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7627.8879 | -242.0583 | 0.924 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7674.1792 | 243.5273 | -6.9564 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4511 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.4511 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8602 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.8602 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C8 | 238 | C6 (0F-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 15709 | 3.21 | 0.753 |
| Bottom | 15709 | 3.21 | 0.758 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7264.5054 | -230.527 | -1.1349 | 2520 | 203] 1.5 [DL + RSY] |
| Bottom | 7310.7967 | 231.9959 | 1.7667 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.562 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.562 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2342 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2342 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C9 | 239 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.728 |
| Bottom | 13745 | 2.29 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7417.6518 | 210.6613 | -48.6323 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 7474.3351 | 212.2711 | -68.4713 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.1678 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.1678 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.2729 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.2729 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C10 | 240 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.754 |
| Bottom | 13745 | 2.29 | 0.756 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7676.1015 | -218.0013 | -47.9361 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 7732.7848 | 219.6111 | -66.9351 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.0321 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.0321 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.7207 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.7207 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C11 | 241 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.711 |
| Bottom | 13745 | 2.29 | 0.713 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7238.2531 | 205.5664 | -47.8129 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 7294.9364 | 207.1762 | -67.8358 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.4809 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.4809 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.1725 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.1725 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 1F(+4.45) | C12 | 242 | C11 (0-1F) | 4200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 17.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 13745 | 2.29 | 0.723 |
| Bottom | 13745 | 2.29 | 0.725 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7363.7824 | -209.1314 | -47.3039 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 7420.4657 | 210.7412 | -66.2461 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.4034 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.4034 | 1680 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.4467 | 4200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.4467 | 1680 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C1 | 474 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.788 |
| Bottom | 14292 | 2.92 | 0.791 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7266.0795 | 216.7714 | 0.7511 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7301.9002 | 217.84 | 3.0428 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6195 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6195 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3261 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3261 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C2 | 475 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.829 |
| Bottom | 11116 | 2.27 | 0.831 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6814.1963 | -203.2902 | -0.2334 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 6850.017 | 204.3588 | -7.0991 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8003 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.8003 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.578 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.578 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C3 | 476 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.781 |
| Bottom | 14292 | 2.92 | 0.784 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7200.5127 | -214.8153 | -0.1677 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7236.3334 | 215.8839 | -4.174 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5258 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5258 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1029 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1029 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C4 | 477 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.811 |
| Bottom | 11116 | 2.27 | 0.813 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6670.4621 | -199.0021 | -0.1237 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 6706.2827 | 200.0708 | 7.5426 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3647 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3647 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5673 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.5673 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C5 | 478 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.775 |
| Bottom | 14292 | 2.92 | 0.779 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7145.2758 | -213.1674 | -0.2065 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7181.0965 | 214.236 | 1.0953 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5376 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.5376 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6385 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6385 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C6 | 479 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.825 |
| Bottom | 11116 | 2.27 | 0.828 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6785.7964 | -202.4429 | 0.3003 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 6821.6171 | 203.5116 | -5.7677 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.522 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.522 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7636 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7636 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C7 | 480 | C5 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 14292 | 2.92 | 0.796 |
| Bottom | 14292 | 2.92 | 0.799 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7340.1113 | -218.98 | 0.0878 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7375.932 | 220.0486 | -5.6618 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4438 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4438 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1359 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.1359 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C8 | 481 | C6 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.848 |
| Bottom | 11116 | 2.27 | 0.851 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6972.781 | -208.0213 | -0.4289 | 1950 | 203] 1.5 [DL + RSY] |
| Bottom | 7008.6017 | 209.09 | 4.8473 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3275 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3275 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7251 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7251 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C9 | 482 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.769 |
| Bottom | 11116 | 1.85 | 0.771 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7183.2647 | -190.3565 | -29.6866 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 7227.1268 | 191.5189 | -40.3344 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.4197 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.4197 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.1877 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.1877 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C10 | 483 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.795 |
| Bottom | 11116 | 1.85 | 0.799 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7429.8717 | -196.8916 | -29.641 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 7473.7338 | 198.0539 | -36.3186 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.2443 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.2443 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.4977 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.4977 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C11 | 484 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.752 |
| Bottom | 11116 | 1.85 | 0.754 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7025.1599 | -186.1667 | -29.5561 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 7069.0219 | 187.3291 | -39.9209 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3719 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.3719 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.9543 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.9543 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 2F(+7.7) | C12 | 485 | C11 (1F-2F) | 3250 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 1.85 | 0.763 |
| Bottom | 11116 | 1.85 | 0.767 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7133.0566 | -189.026 | -29.1602 | 1950 | 202] 1.5 [DL + RSX] |
| Bottom | 7176.9187 | 190.1883 | -35.3936 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3149 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.3149 | 1300 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.2013 | 3250 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.2013 | 1300 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C1 | 701 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.8 |
| Bottom | 12704 | 2.59 | 0.804 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6979.0321 | 206.812 | 1.3307 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7013.7506 | 207.8408 | 0.7764 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7755 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7755 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3008 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.3008 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C2 | 702 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.822 |
| Bottom | 10322 | 2.11 | 0.826 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6558.2942 | -194.3441 | 0.0055 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6593.0127 | 195.3729 | -0.8497 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.3719 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.3719 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3284 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.3284 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C3 | 703 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.792 |
| Bottom | 12704 | 2.59 | 0.796 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6914.4133 | -204.8971 | 0.0368 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6949.1318 | 205.9259 | -2.5023 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6163 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.6163 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9003 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.9003 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C4 | 704 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.804 |
| Bottom | 10322 | 2.11 | 0.808 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6418.6501 | -190.206 | -1.8217 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6453.3686 | 191.2348 | -2.0478 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5359 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.5359 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0307 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.0307 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C5 | 705 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.786 |
| Bottom | 12704 | 2.59 | 0.789 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6857.9269 | -203.2232 | 0.9015 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6892.6454 | 204.2521 | 2.3751 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0644 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.0644 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.2504 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.2504 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C6 | 706 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.819 |
| Bottom | 10322 | 2.11 | 0.824 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6540.6079 | 193.82 | 1.2275 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6575.3264 | 194.8488 | 0.9967 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9214 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9214 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7144 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.7144 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C7 | 707 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.807 |
| Bottom | 12704 | 2.59 | 0.81 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7040.848 | -208.6438 | 0.1216 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 7075.5665 | 209.6726 | -4.8009 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3762 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3762 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.503 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.503 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C8 | 708 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.841 |
| Bottom | 10322 | 2.11 | 0.845 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6712.476 | -198.913 | -1.6511 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6747.1945 | 199.9419 | -1.7364 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5593 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.5593 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.2263 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.2263 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C9 | 709 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.767 |
| Bottom | 10322 | 1.72 | 0.77 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6959.1119 | -183.0246 | -19.3793 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7001.6243 | 184.1427 | -28.4185 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.6441 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.6441 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3846 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.3846 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C10 | 710 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.792 |
| Bottom | 10322 | 1.72 | 0.795 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 7188.9645 | -189.0698 | -20.3239 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 7231.477 | 190.1878 | -27.0343 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5982 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.5982 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.6766 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.6766 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C11 | 711 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.749 |
| Bottom | 10322 | 1.72 | 0.752 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6799.2163 | -178.8194 | -19.3766 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6841.7288 | 179.9375 | -28.6468 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.7957 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.7957 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3898 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.3898 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 3F(+10.85) | C12 | 712 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.759 |
| Bottom | 10322 | 1.72 | 0.762 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6892.6452 | 181.2766 | -20.3225 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6935.1577 | 182.3946 | -27.7872 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.307 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.307 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.7811 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.7811 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C1 | 928 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.705 |
| Bottom | 7940 | 1.62 | 0.709 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5105.1644 | 151.283 | 1.1547 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5155.3212 | -8.1559 | 152.7694 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.1554 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.1554 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9875 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9875 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C2 | 929 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.671 |
| Bottom | 7940 | 1.62 | 0.673 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4855.973 | -143.8987 | 1.8592 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4867.5458 | 144.2416 | -0.5649 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6521 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6521 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.076 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.076 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C3 | 930 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.696 |
| Bottom | 7940 | 1.62 | 0.699 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5041.7989 | 149.4053 | -3.0929 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5081.1866 | 150.5725 | 8.5273 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.399 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.399 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.9501 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.9501 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C4 | 931 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.655 |
| Bottom | 7940 | 1.62 | 0.658 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4749.8491 | -140.7539 | -3.7565 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4761.4219 | 141.0968 | -1.0405 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0167 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0167 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.2053 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.2053 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C5 | 932 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.689 |
| Bottom | 7940 | 1.62 | 0.695 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4988.3899 | 147.8226 | 1.0778 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5046.2199 | -7.3185 | 149.5363 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.7817 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.7817 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1141 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.1141 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C6 | 933 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.675 |
| Bottom | 7940 | 1.62 | 0.679 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4893.6903 | 145.0164 | 3.4775 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4928.4088 | 146.0452 | 5.2687 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1029 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1029 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8775 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.8775 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C7 | 934 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.708 |
| Bottom | 7940 | 1.62 | 0.716 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5160.3601 | -12.3989 | -152.9187 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5195.0786 | -6.6548 | 153.9475 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8179 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.8179 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0921 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0921 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C8 | 935 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.688 |
| Bottom | 7940 | 1.62 | 0.69 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4987.7517 | -147.8037 | -2.814 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4999.3245 | 148.1466 | -2.6756 | 1260 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.9754 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.9754 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6101 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.6101 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C9 | 936 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.641 |
| Bottom | 7940 | 1.32 | 0.647 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5331.5697 | -140.2203 | -13.3414 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5374.0821 | 141.3384 | -10.3266 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.3043 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.3043 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.841 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.841 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C10 | 937 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.65 |
| Bottom | 7940 | 1.32 | 0.655 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5409.0715 | -142.2586 | -13.0283 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5451.584 | 143.3767 | 14.8527 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.4707 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.4707 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.4723 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.4723 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C11 | 938 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.618 |
| Bottom | 7940 | 1.32 | 0.625 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5144.5663 | -135.3021 | -13.6265 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5187.0788 | 136.4202 | -7.7919 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.3046 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.3046 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.0013 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.0013 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 10F(+32.9) | C12 | 939 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.612 |
| Bottom | 7940 | 1.32 | 0.617 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5092.6168 | -133.9358 | -13.4299 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5135.1292 | 135.0539 | -14.2391 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.4228 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.4228 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.3217 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.3217 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C1 | 1155 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.74 |
| Bottom | 7940 | 1.62 | 0.744 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5359.0639 | -3.4975 | -158.8069 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5387.2363 | 159.6418 | -2.1961 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.581 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.581 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.635 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.635 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C2 | 1156 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.702 |
| Bottom | 7940 | 1.62 | 0.708 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5088.862 | 150.7999 | 3.9481 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5123.5805 | 151.8288 | 1.4415 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3664 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3664 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7696 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7696 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C3 | 1157 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.73 |
| Bottom | 7940 | 1.62 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5285.7219 | -2.5923 | -156.6336 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5326.6536 | 157.8465 | 1.219 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9637 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9637 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7164 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.7164 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C4 | 1158 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.686 |
| Bottom | 7940 | 1.62 | 0.692 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4977.57 | -147.502 | -4.8538 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5012.2885 | 148.5308 | -2.1679 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3131 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3131 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5092 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.5092 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C5 | 1159 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.723 |
| Bottom | 7940 | 1.62 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5247.7537 | 5.8444 | 155.5084 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5282.4722 | -0.0937 | 156.5373 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2516 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.2516 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.0508 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.0508 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C6 | 1160 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.706 |
| Bottom | 7940 | 1.62 | 0.713 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5120.1106 | -151.7259 | 3.8698 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5154.8291 | 152.7548 | -0.4769 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2558 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.2558 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3892 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3892 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C7 | 1161 | C5 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.744 |
| Bottom | 7940 | 1.62 | 0.75 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5398.6453 | -6.7207 | -159.9799 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5433.3638 | -4.1962 | 161.0087 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8664 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8664 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0049 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0049 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C8 | 1162 | C6 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.62 | 0.72 |
| Bottom | 7940 | 1.62 | 0.726 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5222.3605 | 154.7559 | -4.6894 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5257.079 | 155.7848 | 2.4119 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4855 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4855 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8217 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8217 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C9 | 1163 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.67 |
| Bottom | 7940 | 1.32 | 0.674 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5564.8038 | -146.3543 | -7.7533 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5607.3163 | 147.4724 | -14.108 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7512 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.7512 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.8197 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.8197 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C10 | 1164 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.681 |
| Bottom | 7940 | 1.32 | 0.688 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5664.2552 | -148.9699 | 12.3505 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5706.7676 | -150.088 | -6.8837 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3231 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.3231 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.5798 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.5798 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C11 | 1165 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.649 |
| Bottom | 7940 | 1.32 | 0.652 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5383.3247 | -141.5814 | -5.8075 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5425.8371 | 142.6995 | -14.1435 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.3878 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.3878 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.743 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.743 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 9F(+29.75) | C12 | 1166 | C11 (8F-10F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7940 | 1.32 | 0.644 |
| Bottom | 7940 | 1.32 | 0.65 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5353.5092 | -140.7973 | -11.1707 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5396.0216 | -141.9154 | -7.2068 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1092 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.1092 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.3385 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.3385 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C1 | 1382 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.725 |
| Bottom | 9528 | 1.94 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5609.0658 | -166.2153 | -1.5575 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5643.7843 | 167.2441 | -0.4933 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2978 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.2978 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.0017 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.0017 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C2 | 1383 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.711 |
| Bottom | 8734 | 1.78 | 0.715 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5325.2654 | 157.8054 | -1.2685 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5359.9839 | 158.8342 | 2.3741 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0353 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.0353 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0316 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0316 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C3 | 1384 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.718 |
| Bottom | 9528 | 1.94 | 0.722 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5548.9928 | 164.4352 | 0.9516 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5583.7113 | 165.464 | -0.3278 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1974 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.1974 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2287 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2287 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C4 | 1385 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.696 |
| Bottom | 8734 | 1.78 | 0.7 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5208.9364 | -154.3581 | 0.6562 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5243.6549 | 155.387 | 1.6663 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.1137 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.1137 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6672 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.6672 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C5 | 1386 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.709 |
| Bottom | 9528 | 1.94 | 0.715 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5489.4466 | -162.6706 | -2.0964 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5524.1651 | 163.6994 | -0.2514 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1704 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.1704 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6293 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.6293 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C6 | 1387 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.714 |
| Bottom | 8734 | 1.78 | 0.719 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5349.7546 | -158.5311 | -1.3376 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5384.4731 | 159.5599 | 0.4259 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6009 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.6009 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.472 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.472 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C7 | 1388 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.728 |
| Bottom | 9528 | 1.94 | 0.732 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5641.706 | -5.5735 | -167.1826 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5676.4245 | -5.4817 | 168.2114 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.249 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.249 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6958 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6958 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C8 | 1389 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.729 |
| Bottom | 8734 | 1.78 | 0.734 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5461.1375 | -161.8317 | 1.6847 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5495.856 | 162.8605 | 1.1074 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0933 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.0933 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.5383 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.5383 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C9 | 1390 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.678 |
| Bottom | 8734 | 1.46 | 0.682 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5798.5716 | -152.5024 | -8.9894 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5841.0841 | 153.6205 | -10.654 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.4259 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.4259 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.5459 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.5459 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C10 | 1391 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.692 |
| Bottom | 8734 | 1.46 | 0.697 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5920.4434 | -155.7077 | -7.7722 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5962.9558 | 156.8257 | -7.2981 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.3575 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.3575 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.3692 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.3692 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C11 | 1392 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.657 |
| Bottom | 8734 | 1.46 | 0.662 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5622.1105 | -147.8615 | -8.6746 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5664.6229 | -148.9796 | -10.912 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3325 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.3325 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.5003 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.5003 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 8F(+26.6) | C12 | 1393 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.657 |
| Bottom | 8734 | 1.46 | 0.661 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5614.4209 | -147.6593 | -7.3141 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5656.9333 | 148.7773 | -7.8095 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8693 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.8693 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.169 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.169 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C1 | 1609 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.76 |
| Bottom | 9528 | 1.94 | 0.764 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5872.7448 | -174.029 | -0.3904 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5907.4633 | 175.0578 | 0.8338 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0361 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.0361 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5451 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5451 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C2 | 1610 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.744 |
| Bottom | 8734 | 1.78 | 0.748 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5565.1502 | -164.9139 | 0.0085 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5599.8686 | 165.9428 | -2.0661 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.5742 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.5742 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.3425 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.3425 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C3 | 1611 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.752 |
| Bottom | 9528 | 1.94 | 0.756 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5812.134 | -172.2329 | -0.3541 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5846.8525 | -173.2617 | -1.8098 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9516 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9516 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.7463 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.7463 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C4 | 1612 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.727 |
| Bottom | 8734 | 1.78 | 0.732 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5443.9195 | -161.3215 | -0.7196 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5478.638 | 162.3503 | 0.4698 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6609 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.6609 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9418 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.9418 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C5 | 1613 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.744 |
| Bottom | 9528 | 1.94 | 0.748 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5752.6011 | -170.4687 | -0.9477 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5787.3196 | 171.4976 | 1.0999 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8551 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8551 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1867 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1867 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C6 | 1614 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.746 |
| Bottom | 8734 | 1.78 | 0.75 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5582.4962 | -165.428 | 0.0022 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5617.2147 | 166.4568 | 0.4877 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7692 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7692 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7989 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7989 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C7 | 1615 | C5 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.763 |
| Bottom | 9528 | 1.94 | 0.766 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5897.6904 | -174.7682 | 0.3516 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5932.4089 | 175.7971 | -3.0841 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8206 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.8206 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9363 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.9363 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C8 | 1616 | C6 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.78 | 0.762 |
| Bottom | 8734 | 1.78 | 0.767 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5703.9432 | -169.0269 | 0.0514 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5738.6617 | 170.0557 | 0.1863 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.203 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.203 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7579 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7579 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C9 | 1617 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.706 |
| Bottom | 8734 | 1.46 | 0.71 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6032.6285 | -158.6581 | -6.9842 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6075.1409 | 159.7762 | -10.6161 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.6516 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.6516 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.673 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.673 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C10 | 1618 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.722 |
| Bottom | 8734 | 1.46 | 0.727 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6177.1717 | -162.4596 | -7.8942 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6219.6841 | -163.5777 | -7.3352 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5934 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.5934 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.441 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.441 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C11 | 1619 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.685 |
| Bottom | 8734 | 1.46 | 0.69 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5860.5905 | -154.1335 | -6.8246 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5903.1029 | 155.2516 | -10.8252 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.5018 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.5018 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.6456 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.6456 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 7F(+23.45) | C12 | 1620 | C11 (6F-8F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 8734 | 1.46 | 0.687 |
| Bottom | 8734 | 1.46 | 0.692 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5874.893 | -154.5097 | -7.6286 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5917.4054 | -155.6278 | -7.814 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.0479 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.0479 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.2646 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.2646 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C1 | 1836 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.747 |
| Bottom | 11116 | 2.27 | 0.751 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6142.2911 | 182.0166 | 0.2031 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6177.0096 | -183.0454 | 1.1456 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8025 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8025 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1498 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.1498 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C2 | 1837 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.751 |
| Bottom | 9528 | 1.94 | 0.755 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5808.5875 | -172.1278 | 0.7417 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5843.306 | 173.1566 | 2.1629 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.019 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.019 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1181 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.1181 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C3 | 1838 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.739 |
| Bottom | 11116 | 2.27 | 0.743 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6080.7693 | -180.1935 | -0.9477 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6115.4878 | 181.2223 | -2.3231 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7207 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7207 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4031 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.4031 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C4 | 1839 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.735 |
| Bottom | 9528 | 1.94 | 0.74 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5682.5719 | -168.3935 | 1.0375 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5717.2904 | 169.4224 | 0.4349 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1123 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.1123 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.7078 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.7078 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C5 | 1840 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.732 |
| Bottom | 11116 | 2.27 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6021.7684 | -178.4451 | -0.4215 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6056.4869 | 179.4739 | 1.5344 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6371 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.6371 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.8792 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.8792 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C6 | 1841 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.752 |
| Bottom | 9528 | 1.94 | 0.757 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5818.2675 | -172.4147 | 0.8316 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5852.986 | 173.4435 | -0.2803 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.1948 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.1948 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5981 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.5981 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C7 | 1842 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.751 |
| Bottom | 11116 | 2.27 | 0.754 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6174.9288 | -182.9837 | -0.194 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6209.6473 | 184.0125 | -3.6031 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.5787 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.5787 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.593 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.593 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C8 | 1843 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.77 |
| Bottom | 9528 | 1.94 | 0.774 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5950.7538 | 176.3407 | -0.7355 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5985.4723 | 177.3695 | 0.3734 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3676 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.3676 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.574 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.574 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C9 | 1844 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.712 |
| Bottom | 9528 | 1.59 | 0.716 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6266.6141 | -164.812 | -7.1513 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6309.1265 | 165.93 | -11.8702 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.2756 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.2756 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.536 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.536 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C10 | 1845 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.731 |
| Bottom | 9528 | 1.59 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6433.7629 | -169.208 | -7.9646 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6476.2753 | 170.326 | -8.628 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.4035 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.4035 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.2041 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.2041 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C11 | 1846 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.693 |
| Bottom | 9528 | 1.59 | 0.697 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6098.4168 | 160.3884 | -7.0337 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6140.9293 | 161.5064 | -12.0832 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1964 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.1964 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.502 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.502 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 6F(20.3) | C12 | 1847 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.697 |
| Bottom | 9528 | 1.59 | 0.702 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6134.2776 | -161.3315 | -7.7642 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6176.7901 | 162.4496 | -9.1217 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8913 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.8913 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.0792 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.0792 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C1 | 2063 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.78 |
| Bottom | 11116 | 2.27 | 0.784 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6416.914 | -190.1546 | 0.2093 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6451.6325 | 191.1834 | 1.271 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8258 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8258 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.7257 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.7257 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C2 | 2064 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.783 |
| Bottom | 9528 | 1.94 | 0.787 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6055.4014 | -179.4417 | 0.8461 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6090.1199 | 180.4706 | 1.769 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.813 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.813 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8481 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8481 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C3 | 2065 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.772 |
| Bottom | 11116 | 2.27 | 0.776 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6354.3608 | -188.3009 | -0.979 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6389.0793 | 189.3297 | -2.6271 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.744 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.744 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0374 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0374 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C4 | 2066 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.766 |
| Bottom | 9528 | 1.94 | 0.771 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5924.7108 | -175.5689 | 0.7568 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 5959.4293 | 176.5978 | 0.4181 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.911 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.911 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.4399 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.4399 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C5 | 2067 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.765 |
| Bottom | 11116 | 2.27 | 0.769 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6296.0796 | 186.5738 | -0.336 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6330.7981 | -187.6026 | 1.7441 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.6643 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.6643 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5257 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5257 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C6 | 2068 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.783 |
| Bottom | 9528 | 1.94 | 0.788 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6056.7608 | -179.482 | -0.818 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6091.4793 | 180.5108 | -0.8743 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3312 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.3312 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3461 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.3461 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C7 | 2069 | C5 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 11116 | 2.27 | 0.785 |
| Bottom | 11116 | 2.27 | 0.788 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6458.3566 | -191.3826 | -0.2095 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6493.0751 | 192.4115 | -3.8996 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.542 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.542 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1856 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1856 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C8 | 2070 | C6 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.94 | 0.802 |
| Bottom | 9528 | 1.94 | 0.807 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6201.2964 | -183.7651 | 0.8479 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6236.0149 | 184.7939 | 0.5865 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8249 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8249 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5242 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5242 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C9 | 2071 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.739 |
| Bottom | 9528 | 1.59 | 0.742 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6499.7153 | -170.9425 | -8.7815 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6542.2278 | 172.0606 | -14.8149 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9387 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9387 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3688 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.3688 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C10 | 2072 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.76 |
| Bottom | 9528 | 1.59 | 0.764 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6688.9997 | -175.9207 | -9.5113 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6731.5122 | 177.0388 | -11.8282 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2722 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.2722 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.9432 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.9432 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C11 | 2073 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.72 |
| Bottom | 9528 | 1.59 | 0.723 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6334.806 | -166.6054 | -8.7125 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6377.3184 | -167.7235 | -14.9708 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.901 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.901 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.405 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.405 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 5F(17.15) | C12 | 2074 | C11 (4F-6F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 9528 | 1.59 | 0.726 |
| Bottom | 9528 | 1.59 | 0.73 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6391.4027 | -168.0939 | -9.3542 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6433.9152 | 169.212 | -12.301 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8031 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.8031 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.8669 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.8669 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C1 | 2290 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.767 |
| Bottom | 12704 | 2.59 | 0.771 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6696.0428 | 198.4261 | 0.6986 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6730.7613 | 199.4549 | 2.7002 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3313 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.3313 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.2222 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.2222 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C2 | 2291 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.79 |
| Bottom | 10322 | 2.11 | 0.794 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6305.3705 | -186.8491 | 1.2259 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6340.089 | 187.878 | -1.8636 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.757 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.757 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.4776 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.4776 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C3 | 2292 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.76 |
| Bottom | 12704 | 2.59 | 0.763 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6632.4412 | -196.5413 | 0.4881 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6667.1597 | 197.5702 | -4.4434 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3145 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.3145 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5753 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5753 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C4 | 2293 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.773 |
| Bottom | 10322 | 2.11 | 0.777 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6170.1271 | -182.8414 | 0.0292 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6204.8456 | 183.8703 | -0.3713 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.9122 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.9122 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0802 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.0802 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C5 | 2294 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.754 |
| Bottom | 12704 | 2.59 | 0.757 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6574.9983 | -194.8391 | 0.1855 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6609.7168 | 195.8679 | 3.1539 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9615 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9615 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.1355 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.1355 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C6 | 2295 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.789 |
| Bottom | 10322 | 2.11 | 0.793 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6297.6424 | -186.6201 | -0.1711 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6332.3609 | -187.649 | -0.5991 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2319 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.2319 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0179 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0179 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C7 | 2296 | C5 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 12704 | 2.59 | 0.773 |
| Bottom | 12704 | 2.59 | 0.776 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6747.3114 | -199.9453 | -0.6867 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6782.0299 | 200.9742 | -5.4371 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9741 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.9741 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9764 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.9764 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C8 | 2297 | C6 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 2.11 | 0.809 |
| Bottom | 10322 | 2.11 | 0.813 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6455.263 | 191.291 | 0.1838 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 6489.9815 | 192.3198 | 0.239 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.4065 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.4065 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5189 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5189 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C9 | 2298 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.743 |
| Bottom | 10322 | 1.72 | 0.746 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6730.9372 | -177.0236 | -12.6149 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6773.4497 | 178.1417 | -20.0441 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.6731 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.6731 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.3474 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.3474 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C10 | 2299 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.766 |
| Bottom | 10322 | 1.72 | 0.77 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6941.3452 | -182.5574 | -13.3475 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6983.8577 | 183.6755 | -17.5632 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2857 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.2857 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.7067 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.7067 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C11 | 2300 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.725 |
| Bottom | 10322 | 1.72 | 0.728 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6568.7874 | -172.7591 | -12.5424 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6611.2998 | 173.8772 | -20.1312 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.7119 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.7119 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.418 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.418 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 4F(+14) | C12 | 2301 | C11 (2F-4F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 1000 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 10322 | 1.72 | 0.733 |
| Bottom | 10322 | 1.72 | 0.737 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 6644.783 | -174.7578 | -13.2031 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 6687.2955 | 175.8759 | -18.0632 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.8365 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.8365 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 0.7401 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 0.7401 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C1 | 2539 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.72 |
| Bottom | 6352 | 1.3 | 0.725 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4864.2737 | 144.1446 | -4.6319 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4898.9922 | 145.1735 | -4.7832 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8046 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.8046 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0848 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0848 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C2 | 2540 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.659 |
| Bottom | 7146 | 1.46 | 0.663 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4613.2095 | -136.7048 | -3.4853 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4647.928 | 137.7336 | -5.4869 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7413 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7413 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.395 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.395 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C3 | 2541 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.712 |
| Bottom | 6352 | 1.3 | 0.717 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4795.3285 | 142.1016 | 1.0059 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4830.047 | 143.1304 | 1.7002 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.0316 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.0316 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8731 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8731 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C4 | 2542 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.646 |
| Bottom | 7146 | 1.46 | 0.65 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4512.9479 | -133.7337 | 0.1615 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4547.6664 | 134.7625 | 1.608 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5975 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.5975 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0798 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0798 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C5 | 2543 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.704 |
| Bottom | 6352 | 1.3 | 0.71 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4777.5635 | -12.3531 | -141.5751 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4812.282 | -9.2436 | 142.604 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.404 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.404 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6362 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6362 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C6 | 2544 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.665 |
| Bottom | 7146 | 1.46 | 0.668 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4656.1797 | -137.9781 | -3.0425 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4690.8982 | 139.007 | -8.5627 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.2909 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.2909 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0603 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0603 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C7 | 2545 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.725 |
| Bottom | 6352 | 1.3 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4923.1908 | 13.0703 | -145.8906 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4914.8258 | 145.6427 | 2.7656 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.1835 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.1835 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2278 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2278 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C8 | 2546 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.678 |
| Bottom | 7146 | 1.46 | 0.683 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4742.6624 | 140.5409 | 2.3344 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4777.3809 | 141.5697 | 2.5105 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.6426 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.6426 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4108 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.4108 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C9 | 2547 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.766 |
| Bottom | 6352 | 1.32 | 0.767 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5107.4365 | -134.3256 | -9.9446 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5141.4465 | 135.22 | 20.0537 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.8154 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.8154 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3432 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3432 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C10 | 2548 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.775 |
| Bottom | 6352 | 1.32 | 0.779 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 5163.5579 | -135.8016 | -9.6389 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 5197.5679 | -136.696 | -11.5826 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.2168 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.2168 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.171 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.171 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C11 | 2549 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.737 |
| Bottom | 6352 | 1.32 | 0.739 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4915.5244 | -129.2783 | -11.3138 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4949.5344 | 130.1728 | 17.1905 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.641 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.641 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3523 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3523 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 11F(+36.05) | C12 | 2550 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.726 |
| Bottom | 6352 | 1.32 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4838.4121 | -127.2502 | -10.5967 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4872.4221 | 128.1447 | -14.6628 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.0562 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.0562 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2524 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2524 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C1 | 2824 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.338 |
| Bottom | 3054 | 0.62 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1956.8818 | -57.9889 | -36.1237 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1991.6003 | -7.159 | 59.0178 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2458 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2458 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9238 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9238 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C2 | 2825 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.299 |
| Bottom | 3054 | 0.62 | 0.304 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1715.811 | -2.9553 | 50.8452 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1738.9567 | 1.5658 | 51.5311 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.2065 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.2065 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.193 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.193 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C3 | 2826 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.333 |
| Bottom | 3054 | 0.62 | 0.34 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1928.6852 | -57.1534 | -35.1138 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1963.4037 | 7.5567 | 58.1822 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.298 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.298 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4117 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.4117 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C4 | 2827 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.289 |
| Bottom | 3054 | 0.62 | 0.295 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1651.2818 | -0.2822 | -48.933 | 2520 | 202] 1.5 [DL + RSX] |
| Bottom | 1686.0003 | 0.4591 | 49.9618 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8571 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8571 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7136 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.7136 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C5 | 2828 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.332 |
| Bottom | 3054 | 0.62 | 0.34 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1915.7139 | -56.769 | 48.2393 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1950.4324 | -3.7427 | 57.7978 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2886 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2886 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3259 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.3259 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C6 | 2829 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.299 |
| Bottom | 3054 | 0.62 | 0.307 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1722.6456 | -51.0477 | -5.9647 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1757.3641 | -2.889 | 52.0766 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0008 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0008 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6979 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.6979 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C7 | 2830 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.346 |
| Bottom | 3054 | 0.62 | 0.353 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2000.628 | -59.2853 | 45.0972 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2035.3465 | -7.8503 | 60.3141 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.8199 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.8199 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0129 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0129 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C8 | 2831 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.304 |
| Bottom | 3054 | 0.62 | 0.313 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1757.9043 | -52.0926 | -8.8806 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1792.6228 | 53.1214 | 1.3817 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.6655 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.6655 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.2879 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.2879 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C9 | 2832 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.421 |
| Bottom | 3078 | 0.64 | 0.428 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2374.7991 | -62.4572 | -6.1318 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2408.8091 | 63.3517 | -3.9693 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9752 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.9752 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.9951 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.9951 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C10 | 2833 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.464 |
| Bottom | 3078 | 0.64 | 0.472 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2618.1739 | -68.858 | -6.9811 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2652.1838 | 69.7524 | -3.5643 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.5383 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.5383 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.5723 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.5723 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C11 | 2834 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.368 |
| Bottom | 3078 | 0.64 | 0.374 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2076.1366 | -54.6024 | -7.3772 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2110.1465 | 55.4969 | -6.3177 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.8558 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.8558 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.5656 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.5656 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 22F(+70.7) | C12 | 2835 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.364 |
| Bottom | 3078 | 0.64 | 0.371 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2059.2434 | -54.1581 | -8.4389 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2093.2534 | 55.0526 | -6.3095 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.0091 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.0091 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2755 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.2755 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C1 | 3110 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.387 |
| Bottom | 3054 | 0.62 | 0.392 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2226.9982 | -6.5374 | -65.9934 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2236.0931 | 66.2629 | 0.0985 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3236 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.3236 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6639 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6639 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C2 | 3111 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.343 |
| Bottom | 3054 | 0.62 | 0.35 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1962.37 | 58.1516 | 2.8746 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2005.4623 | 2.9408 | 59.4285 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.8213 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.8213 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.9782 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.9782 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C3 | 3112 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.38 |
| Bottom | 3054 | 0.62 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2194.1012 | -8.5404 | 65.0185 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2204.5363 | 65.3278 | -0.3184 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9749 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9749 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9857 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9857 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C4 | 3113 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.332 |
| Bottom | 3054 | 0.62 | 0.34 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1912.4345 | 6.8841 | -56.6718 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1947.153 | 3.3718 | 57.7006 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.9447 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.9447 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.143 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.143 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C5 | 3114 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.377 |
| Bottom | 3054 | 0.62 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2179.0771 | 9.8782 | -64.5733 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2213.7956 | -3.5564 | 65.6021 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8613 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8613 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7945 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7945 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C6 | 3115 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.348 |
| Bottom | 3054 | 0.62 | 0.352 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1989.0665 | 58.9427 | 1.7017 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2023.785 | 59.9715 | -6.0539 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.3676 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.3676 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4146 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4146 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C7 | 3116 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.393 |
| Bottom | 3054 | 0.62 | 0.4 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2266.7651 | 8.6519 | -67.1718 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2301.4836 | -6.355 | 68.2006 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.9986 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.9986 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4495 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.4495 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C8 | 3117 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.355 |
| Bottom | 3054 | 0.62 | 0.36 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2029.4381 | 60.139 | 0.3222 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2064.1566 | 61.1678 | 3.4416 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9584 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9584 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9136 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9136 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C9 | 3118 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.46 |
| Bottom | 3078 | 0.64 | 0.465 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2589.2312 | -68.0968 | -5.828 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2623.2411 | 68.9912 | -7.65 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9168 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9168 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8196 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.8196 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C10 | 3119 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.497 |
| Bottom | 3078 | 0.64 | 0.507 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2808.0172 | -73.8509 | -9.2193 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2842.0271 | 74.7453 | 0.1955 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3875 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.3875 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.739 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.739 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C11 | 3120 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.409 |
| Bottom | 3078 | 0.64 | 0.414 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2306.9622 | -60.6731 | -6.4239 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2340.9722 | 61.5676 | 8.5984 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9348 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9348 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4848 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.4848 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 21F(+67.55) | C12 | 3121 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.405 |
| Bottom | 3078 | 0.64 | 0.413 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2287.8558 | -60.1706 | 9.055 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2321.8658 | 61.0651 | -2.5844 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.7349 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.7349 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2959 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2959 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C1 | 3396 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.433 |
| Bottom | 3054 | 0.62 | 0.439 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2475.1786 | -73.3478 | -0.6817 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2532.9955 | 10.3676 | 75.0611 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4746 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4746 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2156 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.2156 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C2 | 3397 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.39 |
| Bottom | 3054 | 0.62 | 0.396 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2229.1317 | -66.0566 | -0.3255 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2263.8502 | 67.0854 | -1.5297 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4551 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4551 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7985 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7985 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C3 | 3398 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.427 |
| Bottom | 3054 | 0.62 | 0.432 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2438.1533 | -72.2506 | -1.3686 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2472.8718 | 73.2794 | -1.9875 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9336 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9336 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0008 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.0008 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C4 | 3399 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.377 |
| Bottom | 3054 | 0.62 | 0.384 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2156.6113 | -63.9076 | -1.4403 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2195.7042 | 1.209 | 65.066 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4493 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4493 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3537 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.3537 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C5 | 3400 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.423 |
| Bottom | 3054 | 0.62 | 0.432 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2443.9611 | -11.8291 | -72.4227 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2478.6796 | -4.2882 | 73.4515 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3961 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3961 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.817 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.817 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C6 | 3401 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.395 |
| Bottom | 3054 | 0.62 | 0.4 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2254.8742 | -66.8194 | -0.3049 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2289.5927 | 67.8483 | -3.5932 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.3775 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.3775 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5498 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.5498 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C7 | 3402 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.439 |
| Bottom | 3054 | 0.62 | 0.447 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2535.1553 | -11.9819 | -75.1251 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2569.8738 | -6.5959 | 76.1539 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6747 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6747 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.72 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.72 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C8 | 3403 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.402 |
| Bottom | 3054 | 0.62 | 0.409 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2299.9432 | 68.155 | 1.4324 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2334.6617 | 69.1838 | 0.5549 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8261 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8261 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.9993 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.9993 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C9 | 3404 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.498 |
| Bottom | 3078 | 0.64 | 0.504 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2809.203 | -73.882 | -7.9527 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2843.213 | 74.7765 | -7.3947 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.0699 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.0699 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.9427 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.9427 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C10 | 3405 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.533 |
| Bottom | 3078 | 0.64 | 0.542 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3005.991 | -79.0576 | -7.9909 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3040.0009 | -79.952 | -1.8141 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.0362 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.0362 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.7781 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.7781 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C11 | 3406 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.45 |
| Bottom | 3078 | 0.64 | 0.456 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2541.4121 | -66.8391 | -8.1737 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2575.4221 | 67.7336 | -8.6288 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.9802 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.9802 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7824 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.7824 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 20F(+64.4) | C12 | 3407 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.447 |
| Bottom | 3078 | 0.64 | 0.454 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2520.2331 | -66.2821 | -8.1278 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2554.2431 | 67.1766 | -4.2151 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.3202 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.3202 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.1108 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.1108 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C1 | 3682 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.481 |
| Bottom | 3054 | 0.62 | 0.487 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2747.4847 | 81.4171 | 0.3186 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2803.4193 | 9.9715 | 83.0747 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9983 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9983 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.8317 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.8317 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C2 | 3683 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.437 |
| Bottom | 3054 | 0.62 | 0.443 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2495.0886 | 73.9378 | 0.9267 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2529.807 | 74.9666 | -0.8933 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9762 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9762 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8057 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8057 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C3 | 3684 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.473 |
| Bottom | 3054 | 0.62 | 0.479 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2705.225 | -80.1648 | -2.0385 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2739.9435 | 81.1937 | -2.4656 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4568 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4568 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5201 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5201 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C4 | 3685 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.423 |
| Bottom | 3054 | 0.62 | 0.43 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2417.9692 | 71.6525 | 2.3065 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2452.6877 | 72.6813 | -0.1123 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9339 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9339 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.399 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.399 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C5 | 3686 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.469 |
| Bottom | 3054 | 0.62 | 0.479 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2679.0358 | -79.3888 | 0.204 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2742.9252 | -4.3329 | 81.282 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8609 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8609 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3434 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3434 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C6 | 3687 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.441 |
| Bottom | 3054 | 0.62 | 0.446 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2520.5724 | 74.693 | 0.9241 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2555.2909 | 75.7218 | -3.1159 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8415 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8415 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6434 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6434 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C7 | 3688 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.486 |
| Bottom | 3054 | 0.62 | 0.494 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2772.1109 | -82.1469 | 0.0587 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2838.1942 | -6.401 | 84.1052 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0204 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0204 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5627 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5627 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C8 | 3689 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.45 |
| Bottom | 3054 | 0.62 | 0.456 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2570.1479 | -76.1621 | -0.4468 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2604.8664 | 77.1909 | -0.1564 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.0856 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.0856 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9438 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9438 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C9 | 3690 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.539 |
| Bottom | 3078 | 0.64 | 0.545 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3035.7429 | -79.84 | -8.1653 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3069.7529 | 80.7345 | -8.0529 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.631 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.631 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6351 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.6351 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C10 | 3691 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.57 |
| Bottom | 3078 | 0.64 | 0.579 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3212.6043 | -84.4915 | -9.4551 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3246.6143 | 85.386 | -2.1815 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.5065 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.5065 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.29 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.29 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C11 | 3692 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.493 |
| Bottom | 3078 | 0.64 | 0.499 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2780.9089 | -73.1379 | -8.1582 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2814.9188 | 74.0324 | -9.0906 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.591 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.591 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4668 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4668 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 19F(+61.25) | C12 | 3693 | C11 (18F-22F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3078 | 0.64 | 0.488 |
| Bottom | 3078 | 0.64 | 0.496 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2757.0814 | -72.5112 | -9.2634 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2791.0914 | 73.4057 | -4.5908 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.747 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.747 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6714 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.6714 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C1 | 3968 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.529 |
| Bottom | 3054 | 0.62 | 0.534 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3018.3291 | -89.4432 | 0.5104 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3053.0476 | 90.472 | 2.7365 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9643 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9643 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2924 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2924 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C2 | 3969 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.467 |
| Bottom | 3693 | 0.75 | 0.473 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2760.41 | 81.8001 | 1.1863 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2795.1285 | 82.829 | -0.7855 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9129 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9129 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.661 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.661 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C3 | 3970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.52 |
| Bottom | 3054 | 0.62 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2971.0225 | -88.0413 | -1.7774 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3005.741 | 89.0701 | -2.6757 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4191 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4191 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.0025 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.0025 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C4 | 3971 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.453 |
| Bottom | 3693 | 0.75 | 0.459 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2679.1043 | -79.3908 | 2.0546 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2713.8228 | 80.4196 | -0.3233 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8592 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8592 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.2769 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.2769 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C5 | 3972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.516 |
| Bottom | 3054 | 0.62 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2944.0149 | 87.241 | 0.1583 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3006.5715 | -4.907 | 89.0947 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8192 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8192 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7682 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.7682 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C6 | 3973 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.471 |
| Bottom | 3693 | 0.75 | 0.476 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2786.3119 | -82.5677 | 1.0759 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2821.0304 | 83.5965 | -3.1351 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7717 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7717 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6398 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6398 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C7 | 3974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.533 |
| Bottom | 3054 | 0.62 | 0.541 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3041.1915 | -90.1206 | -0.1497 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3106.4851 | -6.8263 | 92.0555 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.906 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.906 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0457 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.0457 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C8 | 3975 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.48 |
| Bottom | 3693 | 0.75 | 0.487 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2840.2592 | -84.1663 | -0.8108 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2874.9777 | 85.1952 | -0.3244 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8682 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8682 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4986 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.4986 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C9 | 3976 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.562 |
| Bottom | 3663 | 0.76 | 0.568 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3269.0618 | -85.9763 | -8.692 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3303.0717 | 86.8708 | -8.5624 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9665 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9665 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.5968 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.5968 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C10 | 3977 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.589 |
| Bottom | 3663 | 0.76 | 0.597 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3427.6589 | -90.1474 | -9.8264 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3461.6689 | 91.0419 | -2.747 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.6742 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.6742 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.1629 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.1629 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C11 | 3978 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.52 |
| Bottom | 3663 | 0.76 | 0.525 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3025.8104 | -79.5788 | -8.6386 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3059.8204 | 80.4733 | -9.4197 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9107 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9107 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4093 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4093 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 18F(+58.1) | C12 | 3979 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.514 |
| Bottom | 3663 | 0.76 | 0.522 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2998.6276 | -78.8639 | -9.5699 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3032.6376 | 79.7584 | -5.1212 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.9691 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.9691 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.5825 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.5825 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C1 | 4254 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.576 |
| Bottom | 3054 | 0.62 | 0.581 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3287.4124 | 97.417 | 0.3411 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3322.1309 | 98.4458 | 2.8355 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9959 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9959 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.8997 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.8997 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C2 | 4255 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.512 |
| Bottom | 3693 | 0.75 | 0.518 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3025.3079 | 89.65 | 1.0274 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3060.0264 | 90.6788 | -0.7075 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9276 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9276 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8361 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8361 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C3 | 4256 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.566 |
| Bottom | 3054 | 0.62 | 0.572 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3235.2413 | -95.871 | -1.3165 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3269.9598 | 96.8998 | -2.9437 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4479 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4479 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6144 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6144 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C4 | 4257 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.497 |
| Bottom | 3693 | 0.75 | 0.503 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2940.1697 | -87.127 | -1.6747 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 2974.8882 | 88.1559 | -0.579 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8653 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8653 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4605 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.4605 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C5 | 4258 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.562 |
| Bottom | 3054 | 0.62 | 0.57 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3207.3391 | -95.0441 | -0.0826 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3269.2385 | -5.1249 | 96.8784 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8374 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8374 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.3557 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.3557 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C6 | 4259 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.516 |
| Bottom | 3693 | 0.75 | 0.521 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3052.243 | -90.4481 | 0.9169 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3086.9615 | 91.477 | -3.2111 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7611 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7611 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9324 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.9324 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C7 | 4260 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.58 |
| Bottom | 3054 | 0.62 | 0.588 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3308.7624 | -98.0497 | -0.0231 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3374.329 | -6.9912 | 99.9926 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8452 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8452 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.123 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.123 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C8 | 4261 | C6 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.526 |
| Bottom | 3693 | 0.75 | 0.532 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3110.5024 | -92.1746 | -0.7838 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3145.2209 | 93.2034 | -0.3573 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7077 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7077 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.0851 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.0851 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C9 | 4262 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.603 |
| Bottom | 3663 | 0.76 | 0.609 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3509.3849 | -92.2968 | -9.01 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3543.3948 | 93.1913 | -8.854 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3191 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.3191 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.535 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.535 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C10 | 4263 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.627 |
| Bottom | 3663 | 0.76 | 0.636 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3651.0708 | 96.0232 | -10.1333 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3685.0808 | 96.9176 | -3.1211 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9271 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9271 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.0039 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.0039 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C11 | 4264 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.563 |
| Bottom | 3663 | 0.76 | 0.568 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3276.4625 | -86.171 | -8.9307 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3310.4725 | 87.0654 | -9.5788 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.2612 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.2612 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3338 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3338 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 17F(+54.95) | C12 | 4265 | C11 (16F-18F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.76 | 0.557 |
| Bottom | 3663 | 0.76 | 0.565 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3245.129 | -85.3469 | -9.8227 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3279.1389 | 86.2414 | -5.4857 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2491 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.2491 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4709 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4709 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C1 | 4540 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.602 |
| Bottom | 3693 | 0.75 | 0.606 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3554.5874 | -105.3343 | 0.0621 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3608.7479 | 9.5983 | 106.9392 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9963 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9963 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4642 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.4642 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C2 | 4541 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.511 |
| Bottom | 5376 | 1.1 | 0.517 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3289.9535 | -97.4923 | 0.7596 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3324.672 | 98.5211 | -0.7341 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9035 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9035 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.14 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.14 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C3 | 4542 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.592 |
| Bottom | 3693 | 0.75 | 0.597 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3497.739 | -103.6497 | -0.9062 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3532.4575 | 104.6785 | -3.1718 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4469 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4469 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1842 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1842 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C4 | 4543 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.497 |
| Bottom | 5376 | 1.1 | 0.503 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3201.3138 | -94.8656 | -1.2794 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3236.0323 | -95.8944 | -0.7972 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8356 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8356 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7664 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7664 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C5 | 4544 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.587 |
| Bottom | 3693 | 0.75 | 0.595 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3468.842 | -102.7934 | -0.3318 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3530.666 | -4.7765 | 104.6254 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.8368 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.8368 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.912 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.912 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C6 | 4545 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.516 |
| Bottom | 5376 | 1.1 | 0.52 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3318.4728 | -98.3374 | 0.7217 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3353.1913 | -99.3662 | -3.2913 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7205 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7205 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3002 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3002 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C7 | 4546 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.605 |
| Bottom | 3693 | 0.75 | 0.613 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3574.6558 | -105.929 | 0.1576 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3641.4406 | -6.6671 | 107.908 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.7668 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.7668 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4079 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4079 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C8 | 4547 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.526 |
| Bottom | 5376 | 1.1 | 0.531 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3381.0553 | -100.1919 | -0.6925 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3415.7738 | -101.2208 | -0.3303 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5187 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5187 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6767 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6767 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C9 | 4548 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.633 |
| Bottom | 4032 | 0.84 | 0.639 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3756.9393 | -98.8075 | -8.9808 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3790.9493 | 99.702 | -8.6951 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.6503 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.6503 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4683 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4683 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C10 | 4549 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.654 |
| Bottom | 4032 | 0.84 | 0.663 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3882.808 | -102.1179 | -10.0774 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3916.8179 | 103.0123 | -3.0988 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.169 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.169 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8471 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.8471 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C11 | 4550 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.595 |
| Bottom | 4032 | 0.84 | 0.601 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3533.2019 | -92.9232 | -8.9137 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3567.2119 | 93.8177 | -9.3236 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.5831 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.5831 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.2565 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.2565 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 16F(+51.8) | C12 | 4551 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.588 |
| Bottom | 4032 | 0.84 | 0.596 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3496.8403 | -91.9669 | -9.7579 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3530.8502 | 92.8614 | -5.4713 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.511 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.511 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.363 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.363 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C1 | 4826 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.647 |
| Bottom | 3693 | 0.75 | 0.652 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3819.7529 | 113.192 | -0.2315 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3874.3339 | 8.7639 | 114.8094 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9487 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9487 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0224 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0224 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C2 | 4827 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.553 |
| Bottom | 5376 | 1.1 | 0.558 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3554.4854 | 105.3313 | 0.4491 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3589.2039 | 106.3601 | -1.2115 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.8295 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.8295 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.478 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.478 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C3 | 4828 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.636 |
| Bottom | 3693 | 0.75 | 0.641 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3758.463 | 111.3758 | -0.6218 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3815.6354 | 10.2305 | 113.07 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4083 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4083 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.7475 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.7475 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C4 | 4829 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.538 |
| Bottom | 5376 | 1.1 | 0.544 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3462.6806 | 102.6108 | 0.8388 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3497.3991 | 103.6396 | -0.6553 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7635 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7635 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.1075 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.1075 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C5 | 4830 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.631 |
| Bottom | 3693 | 0.75 | 0.64 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3728.3931 | -110.4847 | -0.4973 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3790.6014 | -3.9397 | 112.3282 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7993 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7993 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4664 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.4664 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C6 | 4831 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.558 |
| Bottom | 5376 | 1.1 | 0.561 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3585.082 | -106.2379 | 0.5356 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3619.8005 | 107.2668 | -3.5814 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6361 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6361 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6871 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6871 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C7 | 4832 | C5 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14.9 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3693 | 0.75 | 0.65 |
| Bottom | 3693 | 0.75 | 0.659 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3838.7568 | 113.7552 | 0.3286 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3907.5434 | -5.9661 | 115.7935 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6457 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6457 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7938 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7938 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C8 | 4833 | C6 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.568 |
| Bottom | 5376 | 1.1 | 0.574 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3652.0635 | -108.2228 | -0.5759 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3686.782 | 109.2516 | -0.0659 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.282 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.282 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2603 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2603 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C9 | 4834 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.676 |
| Bottom | 4032 | 0.84 | 0.682 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4011.8999 | -105.513 | -8.4457 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4045.9098 | 106.4074 | -8.1369 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.9638 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.9638 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4354 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4354 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C10 | 4835 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.695 |
| Bottom | 4032 | 0.84 | 0.704 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4122.8204 | -108.4302 | -9.5187 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4156.8303 | -109.3246 | -2.7446 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3985 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.3985 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6693 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.6693 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C11 | 4836 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.64 |
| Bottom | 4032 | 0.84 | 0.645 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3796.3009 | -99.8427 | -8.4209 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3830.3108 | 100.7372 | -8.6899 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.8799 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.8799 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.1605 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.1605 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 15F(+48.65) | C12 | 4837 | C11 (14F-16F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4032 | 0.84 | 0.632 |
| Bottom | 4032 | 0.84 | 0.64 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3753.9607 | -98.7292 | -9.2268 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 3787.9706 | 99.6236 | -5.126 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.7535 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.7535 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.24 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.24 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C1 | 5112 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.635 |
| Bottom | 5376 | 1.1 | 0.64 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4082.8815 | -120.9894 | -0.4519 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4117.6 | 122.0182 | 1.3053 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9409 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9409 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6789 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6789 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C2 | 5113 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.567 |
| Bottom | 6352 | 1.3 | 0.571 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3819.0008 | 113.1697 | 0.1475 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3853.7193 | 114.1985 | -2.2479 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7987 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7987 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.7843 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.7843 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C3 | 5114 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.625 |
| Bottom | 5376 | 1.1 | 0.629 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4017.5257 | -119.0527 | -0.6879 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4075.521 | 9.3012 | 120.7713 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4241 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4241 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.4054 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.4054 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C4 | 5115 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.553 |
| Bottom | 6352 | 1.3 | 0.558 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3724.3969 | -110.3663 | 0.7604 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3759.1154 | -111.3951 | -0.0274 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7525 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7525 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.4209 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.4209 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C5 | 5116 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.62 |
| Bottom | 5376 | 1.1 | 0.628 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3985.9169 | -118.116 | -0.4643 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4048.8213 | -2.9787 | 119.9801 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.7839 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.7839 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.108 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.108 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C6 | 5117 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.572 |
| Bottom | 6352 | 1.3 | 0.575 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3852.1189 | -114.1511 | 0.3244 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3886.8374 | 115.1799 | -4.2432 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5735 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5735 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.029 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.029 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C7 | 5118 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.638 |
| Bottom | 5376 | 1.1 | 0.646 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4137.6694 | -11.2956 | -122.6129 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4172.3879 | -5.5188 | 123.6418 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.5204 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.5204 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.2873 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.2873 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C8 | 5119 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.583 |
| Bottom | 6352 | 1.3 | 0.588 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3923.6329 | 116.2703 | -0.2617 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 3958.3514 | 117.2991 | 0.718 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0279 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0279 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.6918 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.6918 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C9 | 5120 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.673 |
| Bottom | 5376 | 1.12 | 0.678 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4274.3691 | -112.4159 | -7.5109 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4308.3791 | 113.3104 | -7.6987 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.2966 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.2966 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.5717 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.5717 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C10 | 5121 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.688 |
| Bottom | 5376 | 1.12 | 0.696 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4371.0013 | -114.9573 | -8.5385 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4405.0112 | 115.8518 | -2.5584 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.6346 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.6346 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4201 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.4201 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C11 | 5122 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.64 |
| Bottom | 5376 | 1.12 | 0.645 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4065.9477 | -106.9344 | -7.5623 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4099.9576 | 107.8289 | 8.0708 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.197 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.197 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.2853 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.2853 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 14F(+45.5) | C12 | 5123 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.632 |
| Bottom | 5376 | 1.12 | 0.639 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4016.6027 | -105.6367 | -8.3111 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4050.6127 | 106.5311 | -4.8909 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9986 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9986 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.2654 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.2654 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C1 | 5398 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.676 |
| Bottom | 5376 | 1.1 | 0.68 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4344.1521 | -128.7317 | 0.6578 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4400.2164 | 8.8674 | 130.3931 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6638 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6638 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9479 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9479 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C2 | 5399 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.606 |
| Bottom | 6352 | 1.3 | 0.611 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4083.5197 | -121.0083 | 1.1851 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4118.2382 | 122.0371 | -0.5845 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5427 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5427 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.3971 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.3971 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C3 | 5400 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.665 |
| Bottom | 5376 | 1.1 | 0.669 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4275.4702 | -126.6964 | 0.6832 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4333.6332 | 10.0574 | 128.42 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1506 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1506 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6959 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6959 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C4 | 5401 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.592 |
| Bottom | 6352 | 1.3 | 0.596 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 3986.534 | -118.1343 | 0.2172 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4021.2525 | 119.1631 | -1.8107 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.4752 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.4752 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9992 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9992 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C5 | 5402 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.659 |
| Bottom | 5376 | 1.1 | 0.668 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4241.4996 | -125.6898 | 0.8422 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4305.2034 | -3.8155 | 127.5775 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4415 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4415 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.4066 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.4066 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C6 | 5403 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.612 |
| Bottom | 6352 | 1.3 | 0.616 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4119.5663 | -122.0765 | -0.66 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4154.2848 | 123.1053 | -2.5523 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.1801 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.1801 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.6574 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.6574 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C7 | 5404 | C5 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.1 | 0.68 |
| Bottom | 5376 | 1.1 | 0.687 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4401.0912 | -10.0478 | -130.419 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4435.8097 | -6.6869 | 131.4478 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.0739 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.0739 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.6227 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.6227 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C8 | 5405 | C6 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.623 |
| Bottom | 6352 | 1.3 | 0.628 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4195.7979 | -124.3355 | -1.0281 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4230.5164 | 125.3643 | -1.1967 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.5232 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.5232 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.7217 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.7217 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C9 | 5406 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.716 |
| Bottom | 5376 | 1.12 | 0.721 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4544.3601 | -119.5167 | -6.5793 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4578.37 | 120.4111 | -8.1737 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.496 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.496 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7177 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.7177 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C10 | 5407 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.729 |
| Bottom | 5376 | 1.12 | 0.736 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4627.1622 | -121.6944 | -7.5207 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4661.1722 | 122.5888 | -3.4931 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.7134 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.7134 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.1855 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.1855 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C11 | 5408 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.684 |
| Bottom | 5376 | 1.12 | 0.688 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4342.2311 | -114.2007 | -6.6866 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4376.2411 | 115.0951 | 8.4974 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.3337 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.3337 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4296 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4296 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 13F(+42.35) | C12 | 5409 | C11 (12F-14F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 5376 | 1.12 | 0.674 |
| Bottom | 5376 | 1.12 | 0.681 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4284.7723 | -112.6895 | -7.3541 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4318.7822 | 113.584 | -5.5479 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1196 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.1196 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4504 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4504 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C1 | 5684 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.683 |
| Bottom | 6352 | 1.3 | 0.689 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4625.4992 | -7.5035 | -137.069 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4638.544 | 137.4555 | -0.7794 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.0423 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.0423 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9392 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.9392 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C2 | 5685 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.622 |
| Bottom | 7146 | 1.46 | 0.625 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4348.0218 | -128.8464 | 1.6389 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4382.7403 | 129.8752 | 4.453 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7443 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.7443 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.7753 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.7753 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C3 | 5686 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.673 |
| Bottom | 6352 | 1.3 | 0.678 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4533.4459 | -134.3411 | 1.1493 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4568.1644 | 135.3699 | -0.1864 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.5421 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.5421 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.6233 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.6233 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C4 | 5687 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.608 |
| Bottom | 7146 | 1.46 | 0.612 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4249.139 | -125.9162 | 0.919 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4283.8575 | 126.945 | 2.5198 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 1.7596 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 1.7596 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.6094 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.6094 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C5 | 5688 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.667 |
| Bottom | 6352 | 1.3 | 0.673 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4524.6858 | 10.1684 | -134.0815 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4559.4043 | -8.7446 | 135.1103 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.079 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.079 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.3681 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.3681 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C6 | 5689 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.628 |
| Bottom | 7146 | 1.46 | 0.63 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4387.372 | 130.0125 | -0.4599 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4422.0905 | 131.0413 | -5.8626 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.7603 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.7603 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2439 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.2439 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C7 | 5690 | C5 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.3 | 0.688 |
| Bottom | 6352 | 1.3 | 0.692 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4662.7142 | 10.1222 | -138.1718 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4697.4327 | -12.2993 | 139.2006 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4404 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.4404 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.4518 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.4518 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C8 | 5691 | C6 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 7146 | 1.46 | 0.639 |
| Bottom | 7146 | 1.46 | 0.643 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4468.5388 | 132.4177 | 1.6183 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 4503.2573 | 133.4465 | 3.7272 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5563 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.5563 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1059 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1059 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C9 | 5692 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.725 |
| Bottom | 6352 | 1.32 | 0.729 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4821.8586 | -126.8149 | -6.1394 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4855.8686 | -127.7093 | -8.8453 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.6206 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.6206 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.4283 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.4283 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C10 | 5693 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.735 |
| Bottom | 6352 | 1.32 | 0.74 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4891.1245 | -128.6366 | -7.8458 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4925.1344 | 129.531 | -6.5924 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7019 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.7019 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.1862 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.1862 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C11 | 5694 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.695 |
| Bottom | 6352 | 1.32 | 0.699 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4625.2152 | -121.6432 | -6.3945 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4659.2251 | -122.5376 | -9.4161 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.5096 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.5096 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.1457 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.1457 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 12F(+39.2) | C12 | 5695 | C11 (10F-12F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 800 | 16.2 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 6352 | 1.32 | 0.684 |
| Bottom | 6352 | 1.32 | 0.689 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 4558.4646 | -119.8876 | -7.9183 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 4592.4746 | 120.7821 | -8.9049 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.0189 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.0189 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.0538 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.0538 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C1 | 5970 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.288 |
| Bottom | 3054 | 0.62 | 0.3 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1666.5587 | -49.3857 | -31.7604 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1701.2772 | 50.4145 | 66.0923 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1353 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1353 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.6684 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.6684 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C2 | 5971 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.253 |
| Bottom | 3054 | 0.62 | 0.267 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1454.6839 | -3.0963 | 43.1071 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1489.4024 | 44.136 | -67.1259 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0006 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0006 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.9276 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.9276 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C3 | 5972 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.283 |
| Bottom | 3054 | 0.62 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1638.8232 | 9.3749 | -48.5638 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1673.5417 | 49.5926 | -76.6886 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.8433 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.8433 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.9802 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.9802 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C4 | 5973 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.245 |
| Bottom | 3054 | 0.62 | 0.261 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1410.835 | -4.7484 | -41.8077 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1445.5535 | -42.8366 | -68.9323 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.8188 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.8188 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.1345 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.1345 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C5 | 5974 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.284 |
| Bottom | 3054 | 0.62 | 0.306 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1631.6514 | -3.1967 | -48.3513 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1666.3699 | 49.3801 | 87.1434 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.1668 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.1668 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.386 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.386 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C6 | 5975 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.253 |
| Bottom | 3054 | 0.62 | 0.269 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1445.8335 | -42.8449 | -1.5057 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1459.1857 | 43.2405 | 79.1593 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.096 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.096 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.5288 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.5288 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C7 | 5976 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.3 |
| Bottom | 3054 | 0.62 | 0.322 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1712.9089 | 0.1879 | 50.7592 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1747.6274 | 51.788 | -94.4441 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.0562 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.0562 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.3721 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.3721 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C8 | 5977 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.259 |
| Bottom | 3054 | 0.62 | 0.279 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1475.5538 | 43.7256 | 0.0038 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1487.9915 | 44.0941 | -87.8016 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.5079 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.5079 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.3209 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.3209 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C9 | 5978 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.475 |
| Bottom | 3360 | 0.93 | 0.476 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2164.3648 | -56.9228 | -3.2404 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2172.8673 | 57.1464 | -4.6543 | 1260 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.3833 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.3833 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.3015 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 1.3015 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C10 | 5979 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.535 |
| Bottom | 3360 | 0.93 | 0.544 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2442.2638 | -64.2315 | -4.3567 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2467.7713 | 64.9024 | -1.3709 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.467 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.467 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.8938 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.8938 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C11 | 5980 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.405 |
| Bottom | 3360 | 0.93 | 0.406 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1852.5395 | -48.7218 | -3.9699 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1878.0469 | -37.0341 | 49.3926 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.5792 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.5792 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.6718 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 1.6718 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C12 | 5981 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.403 |
| Bottom | 3360 | 0.93 | 0.409 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1840.5841 | -48.4074 | -3.3562 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1860.9901 | 48.944 | -1.8575 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.4852 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.4852 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.1075 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.1075 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C13 | 6210 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.529 |
| Bottom | 2036 | 0.85 | 0.503 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1438.5718 | -28.7714 | 95.1632 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1462.4148 | 29.2483 | -2.9644 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.8529 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 28.8529 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.1592 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.1592 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C14 | 6212 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.242 |
| Bottom | 2036 | 0.85 | 0.256 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 664.951 | -13.299 | 41.2622 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 689.2438 | -22.3711 | -22.1018 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.6147 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.6147 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7103 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.7103 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C15 | 6215 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.481 |
| Bottom | 2036 | 0.85 | 0.441 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1254.0915 | 25.0818 | 103.4721 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1277.9345 | -25.5587 | 1.3679 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.6072 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 30.6072 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.8332 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.8332 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C16 | 6217 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.474 |
| Bottom | 2036 | 0.85 | 0.434 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1234.1383 | -24.6828 | 101.8117 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1257.9812 | 25.1596 | 1.3498 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 29.987 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 29.987 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.4584 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.4584 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C18 | 6219 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.239 |
| Bottom | 2036 | 0.85 | 0.255 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 656.2993 | -13.126 | -40.8627 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 680.5921 | -22.9133 | 21.8243 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.2576 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.2576 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8217 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.8217 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C17 | 6222 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.447 |
| Bottom | 2036 | 0.85 | 0.436 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1185.3461 | -23.7069 | 89.6596 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1117.1877 | 43.8868 | -35.7128 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.2165 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 31.2165 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.1088 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.1088 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C20 | 6225 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.516 |
| Bottom | 2036 | 0.85 | 0.496 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1421.4898 | 28.4298 | 86.2923 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1445.3328 | -28.9067 | -4.2668 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.1933 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 26.1933 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.6994 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.6994 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C19 | 6227 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.457 |
| Bottom | 2036 | 0.85 | 0.438 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1228.7748 | 24.5755 | 86.8657 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1156.7083 | -40.5912 | -36.9761 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.3852 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 30.3852 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.1856 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.1856 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C21 | 6230 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.521 |
| Bottom | 2036 | 0.85 | 0.501 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1439.0915 | -28.7818 | -86.2488 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1462.9344 | 29.2587 | 6.7294 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.7536 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 26.7536 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0853 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.0853 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C22 | 6232 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.256 |
| Bottom | 2036 | 0.85 | 0.265 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 662.5209 | -13.2504 | 56.0526 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 686.8137 | 25.7769 | 22.0238 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 2.8269 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 2.8269 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.3277 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.3277 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C23 | 6235 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.463 |
| Bottom | 2036 | 0.85 | 0.429 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1218.5015 | 24.37 | -95.6677 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1242.3445 | -24.8469 | 0.7386 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.2474 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 28.2474 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.0619 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.0619 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C24 | 6237 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.283 |
| Bottom | 2036 | 0.85 | 0.287 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 748.3644 | -14.9673 | -57.6855 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 772.6573 | 25.0608 | 24.7765 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.1563 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 4.1563 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.0085 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.0085 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C25 | 6241 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.467 |
| Bottom | 2036 | 0.85 | 0.438 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1243.2267 | -24.8645 | -91.8421 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1267.0697 | 25.3414 | 0.3457 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.8324 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 26.8324 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.8893 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.8893 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C26 | 6243 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.514 |
| Bottom | 2036 | 0.85 | 0.494 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1417.8815 | 28.3576 | -85.8323 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1441.7244 | -28.8345 | 5.1924 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.1618 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 26.1618 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.0069 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.0069 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C27 | 6258 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.447 |
| Bottom | 2036 | 0.85 | 0.438 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1194.5017 | 23.89 | -86.704 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1114.5913 | -45.0912 | 35.6298 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.4082 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 31.4082 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4361 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.4361 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C28 | 6262 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.453 |
| Bottom | 2036 | 0.85 | 0.443 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1213.8026 | -24.2761 | -86.7243 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1134.0663 | 44.7049 | 36.2523 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 31.637 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 31.637 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.4747 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.4747 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C29 | 6266 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.44 |
| Bottom | 2036 | 0.85 | 0.43 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1207.2637 | -24.1453 | 75.858 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1231.1067 | 29.2867 | -0.17 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 21.9184 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 21.9184 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.2781 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.2781 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C30 | 6268 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.446 |
| Bottom | 2036 | 0.85 | 0.432 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1222.4238 | 24.4485 | 76.5745 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1246.2668 | -27.3944 | -1.4437 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 22.3697 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 22.3697 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.6373 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.6373 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C31 | 6270 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.483 |
| Bottom | 2036 | 0.85 | 0.471 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1334.6762 | -26.6935 | -79.2614 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1358.5192 | 31.0623 | 43.4273 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.9835 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 23.9835 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 12.8181 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 12.8181 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C32 | 6272 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.476 |
| Bottom | 2036 | 0.85 | 0.458 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1306.006 | 26.1201 | -81.8164 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1329.849 | -26.8255 | 2.9243 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.4742 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 24.4742 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 11.5037 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 11.5037 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C33 | 6274 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.552 |
| Bottom | 3054 | 1.02 | 0.585 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2083.5876 | -41.6718 | -0.5885 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 2101.4698 | -62.6288 | 81.1868 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 38.688 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 38.688 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 15.279 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 15.279 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C35 | 6280 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.469 |
| Bottom | 3054 | 1.02 | 0.501 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1773.7946 | -35.4759 | -3.2846 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1781.7938 | 55.4738 | 68.8366 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 36.1063 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 36.1063 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 11.2986 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 11.2986 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C34 | 6282 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.448 |
| Bottom | 3054 | 1.02 | 0.494 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1691.4283 | -33.8286 | 2.0446 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1709.3105 | -60.0802 | -66.0364 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.8287 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 25.8287 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 10.1888 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 10.1888 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C36 | 6286 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.481 |
| Bottom | 3054 | 1.02 | 0.523 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1822.6326 | 36.4527 | 6.4565 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1840.5148 | 59.9106 | -71.1052 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.2286 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 28.2286 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 9.9458 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 9.9458 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C37 | 6290 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.564 |
| Bottom | 2036 | 0.85 | 0.588 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1622.0695 | 32.4414 | 67.2815 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1647.4097 | -44.3068 | 52.6622 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.4341 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 19.4341 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.1781 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.1781 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C38 | 6293 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.575 |
| Bottom | 2036 | 0.85 | 0.6 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1657.9786 | -33.1596 | 66.8309 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1680.0989 | 45.1941 | 53.7072 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.4291 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 19.4291 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.3545 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.3545 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C39 | 6296 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.239 |
| Bottom | 4196 | 0.75 | 0.252 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1603.3629 | -32.0673 | -5.1636 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1636.7431 | -50.3756 | -85.0561 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.2322 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.2322 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 19.1658 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 19.1658 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C40 | 6298 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.254 |
| Bottom | 4196 | 0.75 | 0.277 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1703.4707 | 34.0694 | -4.5419 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1736.8509 | 64.8887 | -90.2584 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.6665 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.6665 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 22.9959 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 22.9959 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C41 | 6300 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.238 |
| Bottom | 4196 | 0.75 | 0.249 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1591.0303 | 31.8206 | 4.1727 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1624.4104 | -49.3377 | 84.4152 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.8268 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.8268 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 18.4858 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 18.4858 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C42 | 6302 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.245 |
| Bottom | 4196 | 0.75 | 0.265 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1640.7434 | 32.8149 | 2.9137 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1674.1236 | 60.0359 | 86.9986 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.373 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.373 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 21.8544 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 21.8544 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C43 | 6304 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.765 |
| Bottom | 2036 | 0.85 | 0.781 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2244.6057 | -44.8921 | -14.3828 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 2258.9115 | -45.1782 | -0.2611 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 16.7703 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 16.7703 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.6336 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.6336 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 23F(+73.85) | C44 | 6306 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.577 |
| Bottom | 2036 | 0.85 | 0.593 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1666.5611 | -33.3312 | -67.1179 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1666.1563 | 43.9604 | 53.2615 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 19.3709 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 19.3709 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.355 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.355 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C1 | 6325 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.112 |
| Bottom | 3054 | 0.62 | 0.117 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 544.5496 | -18.8953 | -47.5436 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 602.4138 | 33.5737 | 34.051 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.8467 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.8467 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.8218 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.8218 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C2 | 6326 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.121 |
| Bottom | 3054 | 0.62 | 0.119 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 617.0274 | 28.5118 | -40.494 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 674.8915 | 19.9993 | 26.3827 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.4057 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.4057 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.808 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.808 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C3 | 6327 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.111 |
| Bottom | 3054 | 0.62 | 0.116 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 533.8029 | -24.8816 | 45.2385 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 591.6671 | 30.7997 | -36.6721 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.0396 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.0396 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7341 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.7341 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C4 | 6328 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.117 |
| Bottom | 3054 | 0.62 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 579.3103 | 47.1968 | 19.083 | 3150 | 203] 1.5 [DL + RSY] |
| Bottom | 654.5494 | 19.3965 | -29.9958 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.3909 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.3909 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.3843 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.3843 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C5 | 6329 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.111 |
| Bottom | 3054 | 0.62 | 0.11 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 532.3297 | 25.1766 | -45.4252 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 590.1939 | -21.5718 | 31.3219 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.9636 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.9636 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.868 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.868 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C6 | 6330 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.12 |
| Bottom | 3054 | 0.62 | 0.116 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 595.9763 | -17.6608 | -48.7375 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 653.8404 | 22.0123 | 25.78 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1249 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1249 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.5955 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.5955 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C7 | 6331 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.132 |
| Bottom | 3054 | 0.62 | 0.123 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 567.6011 | 37.525 | 62.2621 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 625.4653 | -40.6198 | -31.8414 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.0837 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.0837 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.0156 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.0156 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C8 | 6332 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.131 |
| Bottom | 3054 | 0.62 | 0.118 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 605.9588 | 17.9566 | 64.5917 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 663.8229 | 21.224 | -26.4595 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.8615 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.8615 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 16.5847 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 16.5847 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C9 | 6333 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.306 |
| Bottom | 2688 | 0.75 | 0.312 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1331.4612 | -35.0174 | -2.3091 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1351.8672 | -35.5541 | -1.1587 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.89 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 1.89 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.1179 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.1179 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C10 | 6334 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.389 |
| Bottom | 2688 | 0.75 | 0.395 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1691.0846 | -3.167 | 44.4755 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1709.0348 | -0.152 | 44.9476 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.1832 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.1832 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 12.4873 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 12.4873 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C11 | 6335 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.232 |
| Bottom | 2688 | 0.75 | 0.236 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1004.3142 | -0.4621 | -26.4135 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1024.7202 | -0.8354 | 26.9501 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.4448 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.4448 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.1767 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.1767 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C12 | 6336 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.246 |
| Bottom | 2688 | 0.75 | 0.251 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1070.0833 | 2.2096 | -28.1432 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1090.4893 | 28.6799 | 1.4094 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.4887 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.4887 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.9458 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.9458 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C13 | 6565 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.268 |
| Bottom | 1609 | 0.67 | 0.312 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 551.3798 | -11.0326 | 80.5498 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 575.2228 | 14.9017 | -100.9397 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 59.2622 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 59.2622 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8012 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.8012 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C14 | 6567 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.125 |
| Bottom | 1609 | 0.67 | 0.143 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 256.482 | -5.1296 | 37.6156 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 280.7748 | 5.6155 | -45.7866 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.6672 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.6672 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6334 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6334 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C15 | 6570 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.288 |
| Bottom | 1609 | 0.67 | 0.33 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 508.7993 | 10.176 | 99.8369 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 532.6422 | -10.6528 | -120.345 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 71.9819 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 71.9819 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.7642 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.7642 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C16 | 6572 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.248 |
| Bottom | 1609 | 0.67 | 0.322 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 470.9047 | -9.4181 | 81.8924 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 494.7477 | 9.895 | -120.745 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 66.409 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 66.409 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.1856 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.1856 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C18 | 6574 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.125 |
| Bottom | 1609 | 0.67 | 0.134 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 250.89 | -5.0178 | -39.1095 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 275.1828 | -5.5037 | 40.0987 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.9033 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.9033 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4483 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4483 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C17 | 6577 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.223 |
| Bottom | 1609 | 0.67 | 0.216 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 448.6923 | -8.9738 | 88.4116 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 472.5353 | 9.4507 | -81.1668 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.6853 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.6853 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8115 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.8115 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C20 | 6580 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.256 |
| Bottom | 1609 | 0.67 | 0.297 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 546.0475 | 11.3976 | 71.969 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 569.8905 | -14.2723 | -93.9088 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 54.3363 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 54.3363 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7544 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.7544 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C19 | 6582 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.219 |
| Bottom | 1609 | 0.67 | 0.222 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 464.4462 | 9.2889 | 84.2106 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 488.2892 | -9.7658 | -83.2578 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.3291 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.3291 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4709 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.4709 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C21 | 6585 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.26 |
| Bottom | 1609 | 0.67 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 554.1557 | -11.0831 | -73.7041 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 577.9987 | 13.9061 | 106.041 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 59.6889 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 59.6889 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.3652 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.3652 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C22 | 6587 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.141 |
| Bottom | 1609 | 0.67 | 0.136 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 256.3521 | -5.127 | 47.6785 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 280.6449 | 5.6129 | -40.8815 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.0547 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 8.0547 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3905 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3905 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C23 | 6590 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.239 |
| Bottom | 1609 | 0.67 | 0.328 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 472.6963 | 9.4539 | -75.7985 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 496.5393 | -9.9308 | 123.994 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 66.0195 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 66.0195 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.8366 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.8366 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C24 | 6592 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.145 |
| Bottom | 1609 | 0.67 | 0.157 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 295.1333 | -5.9027 | 44.5754 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 319.4262 | -6.3885 | 47.6561 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.1865 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 9.1865 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4307 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4307 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C25 | 6596 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.273 |
| Bottom | 1609 | 0.67 | 0.325 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 532.4113 | -10.6482 | -88.1055 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 556.2542 | 11.1251 | 114.636 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 66.6708 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 66.6708 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.5668 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.5668 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C26 | 6598 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.258 |
| Bottom | 1609 | 0.67 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 561.1807 | 11.2236 | -70.5721 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 585.0237 | -13.032 | 96.1662 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.4814 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 55.4814 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.5317 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.5317 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C27 | 6600 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.216 |
| Bottom | 1609 | 0.67 | 0.225 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 458.5502 | 9.171 | -83.3203 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 482.3932 | -9.6479 | 85.9383 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.6298 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.6298 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.5776 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.5776 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C28 | 6604 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.221 |
| Bottom | 1609 | 0.67 | 0.242 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 466.2165 | -9.3243 | -85.2134 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 490.0595 | 9.8012 | 95.8429 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 54.2144 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 54.2144 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4036 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.4036 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C29 | 6608 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.212 |
| Bottom | 1609 | 0.67 | 0.229 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 446.9373 | -8.9387 | 61.5947 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 470.7803 | 9.4156 | -68.6873 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.3994 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.3994 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.5478 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.5478 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C30 | 6610 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.216 |
| Bottom | 1609 | 0.67 | 0.242 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 455.1063 | 9.1021 | 62.6307 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 478.9492 | -9.579 | -76.2406 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.1991 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.1991 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.5633 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.5633 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C31 | 6612 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.232 |
| Bottom | 1609 | 0.67 | 0.275 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 494.3386 | -9.8868 | -66.0648 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 518.1816 | 10.3636 | 91.245 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.8499 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 52.8499 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.8452 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.8452 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C32 | 6614 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.233 |
| Bottom | 1609 | 0.67 | 0.263 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 480.4577 | 9.6092 | -69.5166 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 504.3007 | -10.086 | 86.0744 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.1131 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 52.1131 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.4486 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.4486 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C33 | 6616 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.393 |
| Bottom | 2545 | 0.85 | 0.413 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1421.0054 | 28.4201 | 0.4191 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1444.8484 | 28.897 | 94.6794 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 78.0293 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 78.0293 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.6877 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.6877 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C35 | 6622 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.338 |
| Bottom | 2545 | 0.85 | 0.356 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1229.0917 | -24.5818 | -3.3818 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1243.3974 | 24.8679 | 83.3184 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 70.9669 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 70.9669 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.1007 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.1007 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C34 | 6624 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.305 |
| Bottom | 2545 | 0.85 | 0.308 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1109.0398 | -22.1808 | -3.7468 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1118.577 | -22.3715 | -2.2714 | 530 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.8215 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 40.8215 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.715 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.715 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C36 | 6628 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.349 |
| Bottom | 2545 | 0.85 | 0.356 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1268.9276 | -25.3786 | -5.3223 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1283.2334 | 25.6647 | -63.8487 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 49.7751 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 49.7751 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.4675 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.4675 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C37 | 6632 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.241 |
| Bottom | 1609 | 0.67 | 0.263 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 579.1142 | 19.4255 | 37.5965 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 600.6189 | -12.0124 | -65.8337 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 40.5189 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 40.5189 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.7268 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.7268 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C38 | 6635 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.242 |
| Bottom | 1609 | 0.67 | 0.272 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 593.6141 | -19.5428 | 35.432 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 620.8124 | 12.4162 | -68.2685 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 39.6707 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 39.6707 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.4705 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.4705 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C39 | 6638 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.149 |
| Bottom | 3663 | 0.65 | 0.125 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 719.9561 | 57.3263 | -37.4137 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 752.5653 | -17.155 | 89.9907 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.5835 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.5835 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.0921 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.0921 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C40 | 6640 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.152 |
| Bottom | 3663 | 0.65 | 0.135 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 789.1039 | -52.527 | -41.0071 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 808.3585 | 21.7554 | 90.4998 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.2337 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.2337 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.7038 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.7038 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C41 | 6642 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.146 |
| Bottom | 3663 | 0.65 | 0.124 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 714.5776 | 55.7529 | 37.1342 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 746.3739 | -18.2612 | -84.9812 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 3.4566 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 3.4566 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.094 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.094 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C42 | 6644 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.149 |
| Bottom | 3663 | 0.65 | 0.128 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 745.4319 | -55.1407 | 38.7376 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 764.5416 | 20.1471 | -89.8429 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 4.678 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 4.678 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 24.216 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 24.216 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C43 | 6646 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.464 |
| Bottom | 1609 | 0.67 | 0.484 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1261.5228 | -25.2305 | -53.8654 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 1285.3658 | -25.7073 | 68.3362 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.2428 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.2428 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.0145 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.0145 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 26F(+83.3) | C44 | 6648 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.24 |
| Bottom | 1609 | 0.67 | 0.28 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 605.0061 | -12.1001 | -45.2798 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 628.849 | 12.577 | 72.9026 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.9386 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.9386 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.7934 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.7934 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C1 | 6667 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.166 |
| Bottom | 3054 | 0.62 | 0.172 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 912.4108 | -29.5414 | -44.7956 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 970.2749 | 32.3234 | 36.0495 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.3951 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.3951 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6083 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6083 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C2 | 6668 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.16 |
| Bottom | 3054 | 0.62 | 0.165 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 915.8251 | -27.139 | -30.1787 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 950.5436 | 28.1678 | 27.684 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 2.9013 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 2.9013 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.1715 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.1715 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C3 | 6669 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.163 |
| Bottom | 3054 | 0.62 | 0.169 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 895.5532 | -30.0799 | 42.6081 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 953.4173 | 28.3843 | -38.2667 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2228 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.2228 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.3283 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.3283 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C4 | 6670 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.155 |
| Bottom | 3054 | 0.62 | 0.161 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 886.58 | -26.2723 | -29.5886 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 921.2985 | 27.3011 | -31.0225 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.5196 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.5196 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.8525 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.8525 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C5 | 6671 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.163 |
| Bottom | 3054 | 0.62 | 0.168 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 892.2307 | 33.3912 | -41.5351 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 950.0949 | 28.1545 | 38.202 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.203 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.203 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9104 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9104 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C6 | 6672 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.158 |
| Bottom | 3054 | 0.62 | 0.164 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 903.2427 | 26.7661 | 0.1694 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 937.9612 | 27.7949 | -0.546 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.9178 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.9178 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.566 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.566 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C7 | 6673 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.184 |
| Bottom | 3054 | 0.62 | 0.181 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 942.4841 | 44.3807 | 59.4561 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1000.3483 | -38.9226 | -40.4315 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.398 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.398 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 17.7781 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 17.7781 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C8 | 6674 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.166 |
| Bottom | 3054 | 0.62 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 883.0267 | -26.167 | 52.6373 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 954.3643 | 28.281 | 0.0945 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.7337 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.7337 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8687 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.8687 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C9 | 6675 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.363 |
| Bottom | 2688 | 0.75 | 0.37 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1577.792 | -41.4959 | -2.2718 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1607.2772 | 42.2714 | -2.0486 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.7452 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 1.7452 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.8301 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.8301 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C10 | 6676 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.441 |
| Bottom | 2688 | 0.75 | 0.448 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1923.6836 | -50.5929 | -4.8931 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1940.6886 | 51.0401 | 1.5197 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1862 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.1862 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 9.368 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 9.368 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C11 | 6677 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.292 |
| Bottom | 2688 | 0.75 | 0.296 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1269.8363 | -33.3967 | -2.9121 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1290.2423 | 33.9334 | 2.9555 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.1757 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.1757 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.2879 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.2879 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C12 | 6678 | C11 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.303 |
| Bottom | 2688 | 0.75 | 0.309 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1321.4263 | -34.7535 | -3.8246 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1341.8323 | 35.2902 | 1.7012 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.1448 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.1448 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.467 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.467 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C13 | 6907 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.359 |
| Bottom | 1609 | 0.67 | 0.394 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 845.8248 | -16.9165 | 84.2876 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 869.6677 | 17.3934 | -105.4682 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.723 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 61.723 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5563 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.5563 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C14 | 6909 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.18 |
| Bottom | 1609 | 0.67 | 0.182 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 392.815 | -7.8563 | 49.4866 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 417.1078 | 8.3422 | -45.4561 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 11.3825 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 11.3825 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8219 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.8219 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C15 | 6912 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.351 |
| Bottom | 1609 | 0.67 | 0.393 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 751.9854 | 15.0397 | 98.8935 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 775.8284 | -15.5166 | -124.959 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 72.8426 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 72.8426 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.8742 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.8742 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C16 | 6914 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.341 |
| Bottom | 1609 | 0.67 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 720.7193 | -14.4144 | 98.4713 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 744.5622 | 14.8912 | -125.5577 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 72.8123 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 72.8123 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.927 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.927 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C18 | 6916 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.174 |
| Bottom | 1609 | 0.67 | 0.171 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 386.0295 | -7.7206 | -46.3868 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 410.3223 | 8.2064 | 38.4465 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.1507 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 8.1507 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8436 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.8436 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C17 | 6919 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.257 |
| Bottom | 1609 | 0.67 | 0.282 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 691.0687 | -13.8214 | 70.9336 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 714.9116 | 14.2982 | -87.8093 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.7947 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 44.7947 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.6481 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.6481 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C20 | 6922 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.346 |
| Bottom | 1609 | 0.67 | 0.38 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 836.9937 | 16.7399 | 75.6431 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 860.8366 | -17.2167 | -96.8983 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 56.1504 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 56.1504 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.5551 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.5551 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C19 | 6924 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.26 |
| Bottom | 1609 | 0.67 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 715.9948 | 14.3199 | 68.2867 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 739.8378 | -14.7968 | -88.4886 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.3831 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 44.3831 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.25 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.25 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C21 | 6927 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.348 |
| Bottom | 1609 | 0.67 | 0.397 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 848.6982 | -16.974 | -74.5879 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 872.5411 | 17.4508 | 107.2915 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 59.5287 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 59.5287 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.3673 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.3673 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C22 | 6929 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.188 |
| Bottom | 1609 | 0.67 | 0.18 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 391.2293 | -7.8246 | 55.6824 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 415.5222 | 8.3104 | -43.931 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.7058 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 9.7058 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6567 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6567 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C23 | 6932 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.333 |
| Bottom | 1609 | 0.67 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 717.8555 | 14.3571 | -92.9605 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 741.6985 | -14.834 | 126.334 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 71.5186 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 71.5186 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.6202 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.6202 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C24 | 6934 | C2 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.207 |
| Bottom | 1609 | 0.67 | 0.206 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 445.8573 | -8.9171 | -58.0136 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 470.1502 | -9.403 | 51.9066 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 13.6994 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 13.6994 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.7817 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.7817 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C25 | 6938 | C3 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.341 |
| Bottom | 1609 | 0.67 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 765.0603 | -15.3012 | -88.5224 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 788.9033 | 15.7781 | 117.1376 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 66.9668 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 66.9668 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.6544 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.6544 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C26 | 6940 | C1 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.348 |
| Bottom | 1609 | 0.67 | 0.385 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 845.9204 | 16.9184 | -75.1285 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 869.7633 | -17.3953 | 98.892 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 57.1236 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 57.1236 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 7.7371 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 7.7371 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C27 | 6942 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.256 |
| Bottom | 1609 | 0.67 | 0.288 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 700.7717 | 14.0154 | -68.1065 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 724.6147 | -14.4923 | 90.9591 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.4842 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.4842 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.5697 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.5697 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C28 | 6946 | C4 (24F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.259 |
| Bottom | 1609 | 0.67 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 713.0657 | -14.2613 | -67.4061 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 736.9087 | 14.7382 | 98.9933 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.559 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.559 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.3461 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.3461 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C29 | 6950 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.296 |
| Bottom | 1609 | 0.67 | 0.313 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 696.0507 | -13.921 | 69.6772 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 719.8936 | 14.3979 | -77.0749 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.29 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.29 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.1591 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.1591 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C30 | 6952 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.3 |
| Bottom | 1609 | 0.67 | 0.324 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 707.1547 | 14.1431 | 69.7968 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 730.9977 | -14.62 | -83.1425 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 49.2811 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 49.2811 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.9556 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.9556 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C31 | 6954 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.323 |
| Bottom | 1609 | 0.67 | 0.36 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 772.2564 | -15.4451 | -73.2757 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 796.0994 | 15.922 | 96.415 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.7606 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 55.7606 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.4506 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.4506 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C32 | 6956 | C7 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.319 |
| Bottom | 1609 | 0.67 | 0.349 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 751.9668 | 15.0393 | -74.7842 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 775.8098 | -15.5162 | 92.2276 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 54.9654 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 54.9654 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.934 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.934 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C33 | 6958 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.451 |
| Bottom | 2545 | 0.85 | 0.465 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1635.4158 | 32.7083 | 3.087 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1659.2587 | 33.1852 | 92.2392 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 76.7179 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 76.7179 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 8.1456 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 8.1456 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C35 | 6964 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.386 |
| Bottom | 2545 | 0.85 | 0.399 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1399.7523 | -27.995 | -1.7116 | 2120 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1418.8267 | 28.3765 | 80.9311 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 71.5952 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 71.5952 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.6454 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.6454 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C34 | 6966 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.358 |
| Bottom | 2545 | 0.85 | 0.361 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1298.8742 | -25.9775 | -3.7168 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1308.4114 | -26.1682 | -1.3418 | 530 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 41.7529 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 41.7529 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 4.1298 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 4.1298 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C36 | 6970 | C9 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.395 |
| Bottom | 2545 | 0.85 | 0.399 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1438.3536 | -28.7671 | -5.3746 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1443.1222 | 28.8624 | -0.8671 | 1060 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 49.4772 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 49.4772 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.9808 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.9808 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C37 | 6974 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.366 |
| Bottom | 1609 | 0.67 | 0.375 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 922.7571 | 18.4551 | 68.6436 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 946.6001 | -18.932 | -70.3741 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.6654 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.6654 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.0934 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.0934 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C38 | 6977 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.373 |
| Bottom | 1609 | 0.67 | 0.386 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 948.4434 | -18.9689 | 67.9773 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 972.2864 | 19.4457 | -73.0289 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.3833 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.3833 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.1221 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.1221 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C39 | 6980 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.158 |
| Bottom | 3663 | 0.65 | 0.166 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1030.313 | 20.6063 | 2.3784 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1039.0815 | -20.7816 | 101.376 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.7857 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 6.7857 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.5555 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.5555 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C40 | 6982 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.17 |
| Bottom | 3663 | 0.65 | 0.174 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1110.5446 | -22.2109 | 1.0252 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1143.9248 | 22.8785 | 12.1369 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 6.3651 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 6.3651 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 11.3385 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 11.3385 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C41 | 6984 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.157 |
| Bottom | 3663 | 0.65 | 0.164 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1022.3098 | -20.4462 | 0.3676 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1029.1226 | -20.5825 | -99.1655 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.0908 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 7.0908 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.6146 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.6146 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C42 | 6986 | C10 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.163 |
| Bottom | 3663 | 0.65 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1059.3668 | 21.1873 | 0.4633 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1048.1343 | 20.9627 | -100.7044 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 7.3051 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 7.3051 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.7435 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.7435 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C43 | 6988 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.571 |
| Bottom | 1609 | 0.67 | 0.586 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1586.0402 | -31.7208 | -3.9374 | 2120 | 202] 1.5 [DL + RSX] |
| Bottom | 1605.1146 | 32.1023 | 63.3139 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 44.1818 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 44.1818 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.2144 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.2144 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 25F(+80.15) | C44 | 6990 | C8 (24F-HRF) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.375 |
| Bottom | 1609 | 0.67 | 0.393 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 956.6617 | -19.1332 | -67.3445 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 980.5047 | 19.6101 | 76.9319 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 48.3401 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 48.3401 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.158 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.158 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C1 | 7009 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.225 |
| Bottom | 3054 | 0.62 | 0.232 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1301.7744 | -38.5759 | -28.7323 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1336.4929 | 37.7169 | 39.6047 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9342 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.9342 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.8819 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.8819 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C2 | 7010 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.205 |
| Bottom | 3054 | 0.62 | 0.212 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1187.0578 | -35.1765 | -26.8732 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1221.7763 | 3.4958 | 36.2053 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.7389 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.7389 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 6.0058 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 6.0058 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C3 | 7011 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.221 |
| Bottom | 3054 | 0.62 | 0.228 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1279.27 | -37.909 | 26.5682 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1313.9885 | 34.1503 | 38.9379 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.7138 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.7138 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.7153 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.7153 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C4 | 7012 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.199 |
| Bottom | 3054 | 0.62 | 0.206 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1149.9182 | -34.0759 | -27.3321 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1184.6367 | 2.7673 | 35.1047 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.2207 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.2207 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.5282 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.5282 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C5 | 7013 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.221 |
| Bottom | 3054 | 0.62 | 0.228 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1274.0464 | -37.7542 | -33.6068 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1308.7649 | 2.9131 | 38.7831 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.2047 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.2047 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.4521 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.4521 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C6 | 7014 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.205 |
| Bottom | 3054 | 0.62 | 0.209 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1174.9086 | -34.8165 | -2.3126 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1209.6271 | 24.5934 | 35.8453 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.1071 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.1071 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 3.6353 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 3.6353 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C7 | 7015 | C5 (16F-26F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.239 |
| Bottom | 3054 | 0.62 | 0.241 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1316.4788 | 44.529 | 62.0186 | 3150 | 202] 1.5 [DL + RSX] |
| Bottom | 1374.343 | -48.4965 | -43.5258 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.0276 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.0276 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 18.5753 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 18.5753 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C8 | 7016 | C6 (18F-28F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.21 |
| Bottom | 3054 | 0.62 | 0.215 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1198.4371 | 35.5137 | 0.0285 | 1890 | 203] 1.5 [DL + RSY] |
| Bottom | 1233.1556 | -3.0393 | 36.5425 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.2562 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.2562 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.0425 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.0425 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C9 | 7017 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.409 |
| Bottom | 3360 | 0.93 | 0.416 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1869.4353 | -49.1661 | -3.7384 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 1894.9428 | 49.837 | -2.2598 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.2125 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.2125 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.7683 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.7683 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C10 | 7018 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.476 |
| Bottom | 3360 | 0.93 | 0.484 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2176.7074 | 57.2474 | -5.2652 | 1890 | 202] 1.5 [DL + RSX] |
| Bottom | 2193.7123 | 57.6946 | 0.0397 | 630 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.6666 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.6666 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.7578 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.7578 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C11 | 7019 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.337 |
| Bottom | 3360 | 0.93 | 0.343 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1539.3871 | -40.4859 | -2.7953 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1567.2404 | 41.2184 | 3.3991 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.9902 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.9902 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.0565 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.0565 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C12 | 7020 | C11 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3360 | 0.93 | 0.345 |
| Bottom | 3360 | 0.93 | 0.353 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1578.2105 | -41.5069 | -4.2282 | 1890 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1598.6165 | 42.0436 | 0.2428 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 2.2657 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 2.2657 | 1260 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.5005 | 3150 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.5005 | 1260 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C13 | 7249 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.428 |
| Bottom | 2036 | 0.85 | 0.47 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1141.7534 | -22.8351 | 84.1807 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1165.5964 | 23.3119 | -118.5858 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 65.7137 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 65.7137 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.6079 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.6079 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C14 | 7251 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.207 |
| Bottom | 2036 | 0.85 | 0.221 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 529.2856 | -10.5857 | 47.1948 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 553.5784 | 11.0716 | -54.6026 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 10.2566 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 10.2566 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.187 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.187 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C15 | 7254 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.401 |
| Bottom | 2036 | 0.85 | 0.478 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1000.5541 | 20.0111 | 99.4905 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1024.3971 | -20.4879 | -156.0601 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 82.8837 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 82.8837 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.9023 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.9023 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C16 | 7256 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.392 |
| Bottom | 2036 | 0.85 | 0.472 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 975.3241 | -19.5065 | 98.1433 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 999.1671 | 19.9833 | -156.1764 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 82.3949 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 82.3949 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.8658 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.8658 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C18 | 7258 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.203 |
| Bottom | 2036 | 0.85 | 0.211 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 521.44 | -10.4288 | -46.057 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 545.7329 | 10.9147 | 46.3738 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.1069 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.1069 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2301 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2301 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C17 | 7261 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.354 |
| Bottom | 2036 | 0.85 | 0.379 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 935.8497 | -18.717 | 71.8615 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 959.6927 | 19.1939 | -89.6487 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.2499 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.2499 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.7896 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.7896 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C20 | 7264 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.416 |
| Bottom | 2036 | 0.85 | 0.455 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1128.9392 | 22.5788 | 75.8657 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1152.7821 | -23.0556 | -108.1213 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 59.3486 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 59.3486 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.7639 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.7639 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C19 | 7266 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.362 |
| Bottom | 2036 | 0.85 | 0.39 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 970.0267 | 19.4005 | 69.6395 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 993.8697 | 19.8774 | -90.8259 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.0343 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.0343 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6506 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6506 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C21 | 7269 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.42 |
| Bottom | 2036 | 0.85 | 0.469 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1143.7768 | -22.8755 | -74.94 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1167.6198 | 23.3524 | 116.6227 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.919 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 61.919 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 9.6635 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 9.6635 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C22 | 7271 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.217 |
| Bottom | 2036 | 0.85 | 0.222 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 526.9151 | -10.5383 | 57.3663 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 551.2079 | -11.0242 | -55.3956 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.3613 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 9.3613 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.5127 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.5127 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C23 | 7274 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.383 |
| Bottom | 2036 | 0.85 | 0.466 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 966.4881 | 19.3298 | -92.0381 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 990.3311 | -19.8066 | 153.4826 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 79.6253 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 79.6253 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.5575 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.5575 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C24 | 7276 | C2 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.238 |
| Bottom | 2036 | 0.85 | 0.25 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 597.2045 | -11.9441 | -58.045 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 621.4973 | -12.4299 | 62.8404 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 12.5382 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 12.5382 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6336 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.6336 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C25 | 7280 | C3 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.39 |
| Bottom | 2036 | 0.85 | 0.464 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1002.0584 | -20.0412 | -88.5419 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1025.9014 | 20.518 | 144.4808 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 75.4241 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 75.4241 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.5102 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.5102 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C26 | 7282 | C1 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.417 |
| Bottom | 2036 | 0.85 | 0.458 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1131.6191 | 22.6324 | -75.3054 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1155.4621 | -23.1092 | 109.9684 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 60.0355 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 60.0355 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.8043 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.8043 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C27 | 7284 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.354 |
| Bottom | 2036 | 0.85 | 0.385 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 945.3652 | 18.9073 | -69.4006 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 969.2081 | -19.3842 | 92.8137 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.7088 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.7088 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8314 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.8314 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C28 | 7288 | C4 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.358 |
| Bottom | 2036 | 0.85 | 0.395 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 961.4691 | -19.2294 | -68.5003 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 985.312 | -19.7062 | 98.1845 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 47.8327 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 47.8327 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5617 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5617 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C29 | 7292 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.358 |
| Bottom | 2036 | 0.85 | 0.393 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 950.254 | -19.0051 | 71.1801 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 974.097 | 19.4819 | -98.6691 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 54.4862 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 54.4862 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.6605 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.6605 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C30 | 7294 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.362 |
| Bottom | 2036 | 0.85 | 0.402 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 963.6307 | 19.2726 | 71.1442 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 987.4737 | -19.7495 | -103.4459 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.8978 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 55.8978 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.714 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.714 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C31 | 7296 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.392 |
| Bottom | 2036 | 0.85 | 0.444 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1053.0143 | -21.0603 | -74.3143 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1076.8573 | 21.5371 | 117.2877 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 62.1998 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 62.1998 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.8176 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.8176 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C32 | 7298 | C7 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.386 |
| Bottom | 2036 | 0.85 | 0.433 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1027.8403 | 20.5568 | -76.4044 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1051.6833 | -21.0337 | 114.141 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.8925 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 61.8925 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.7304 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.7304 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C33 | 7300 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.491 |
| Bottom | 3054 | 1.02 | 0.501 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1860.2699 | -37.2054 | -4.8009 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1878.1521 | 37.563 | 101.2588 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 80.3281 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 80.3281 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.391 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.391 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C35 | 7306 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.419 |
| Bottom | 3054 | 1.02 | 0.427 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1581.4642 | -31.6293 | -0.6315 | 2120 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1600.5386 | 32.0108 | 87.0592 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 74.1638 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 74.1638 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.3066 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.3066 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C34 | 7308 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.395 |
| Bottom | 3054 | 1.02 | 0.399 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1494.3044 | -29.8861 | -3.8059 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1508.6102 | -30.1722 | -2.8606 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.5737 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.5737 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.0842 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.0842 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C36 | 7312 | C9 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 1.02 | 0.426 |
| Bottom | 3054 | 1.02 | 0.43 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1615.0159 | -32.3003 | -5.4691 | 1590 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1628.7719 | -32.5754 | -5.274 | 530 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.0476 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.0476 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 1.9416 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 1.9416 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C37 | 7316 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.451 |
| Bottom | 2036 | 0.85 | 0.478 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1270.9038 | 25.4181 | 64.9987 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1294.7468 | -25.8949 | -87.1238 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.6006 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.6006 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7028 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.7028 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C38 | 7319 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.46 |
| Bottom | 2036 | 0.85 | 0.49 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1301.8105 | -26.0362 | 64.1037 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1325.6535 | 26.5131 | -89.686 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.0761 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 51.0761 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.5726 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.5726 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C39 | 7322 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.196 |
| Bottom | 4196 | 0.75 | 0.2 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1317.441 | 26.3488 | 6.5708 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1324.401 | -26.488 | 102.9075 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.5199 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 8.5199 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.7271 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.7271 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C40 | 7324 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.21 |
| Bottom | 4196 | 0.75 | 0.213 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1407.9764 | -28.1595 | 4.3804 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1441.3566 | 28.8271 | 18.0302 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.4232 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 8.4232 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.115 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.115 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C41 | 7326 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.195 |
| Bottom | 4196 | 0.75 | 0.198 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1307.1317 | -26.1426 | -5.1851 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1310.9837 | -26.2197 | -102.7544 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 8.4936 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 8.4936 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 10.4778 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 10.4778 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C42 | 7328 | C10 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.5 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 4196 | 0.75 | 0.201 |
| Bottom | 4196 | 0.75 | 0.203 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1350.4655 | -27.0093 | -6.2837 | 1590 | 203] 1.5 [DL + RSY] |
| Bottom | 1383.8456 | -27.6769 | -24.0665 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 9.1726 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 9.1726 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 9.8536 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 9.8536 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C43 | 7330 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.661 |
| Bottom | 2036 | 0.85 | 0.672 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1915.1515 | -38.303 | -1.7278 | 1590 | 202] 1.5 [DL + RSX] |
| Bottom | 1929.4573 | -38.5891 | 82.6254 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.117 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.117 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.7927 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.7927 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| 24F(+77) | C44 | 7332 | C8 (22F-24F) | 3150 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2036 | 0.85 | 0.463 |
| Bottom | 2036 | 0.85 | 0.496 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1310.1948 | -26.2039 | -63.9019 | 2650 | 203] 1.5 [DL + RSY] |
| Bottom | 1334.0378 | 26.6808 | 93.3915 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 51.9769 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 51.9769 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.6551 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.6551 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C1 | 7351 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.054 |
| Bottom | 3054 | 0.62 | 0.082 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 176.0514 | -19.7898 | -28.8994 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 232.9971 | 45.3037 | 32.1527 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.383 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.383 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 15.2098 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 15.2098 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C2 | 7352 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.19 |
| Bottom | 3054 | 0.62 | 0.079 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 183.8313 | 119.1377 | -11.2727 | 3100 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 362.3697 | 38.6842 | -12.0195 | 1240 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.6549 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.6549 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 38.1825 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 38.1825 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C3 | 7353 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.053 |
| Bottom | 3054 | 0.62 | 0.072 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 172.112 | -18.5105 | 29.5103 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 229.0577 | 34.3768 | -32.2175 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 11.492 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 11.492 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 12.2693 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 12.2693 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C4 | 7354 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.193 |
| Bottom | 3054 | 0.62 | 0.077 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 175.6448 | 119.211 | 11.1525 | 3100 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 378.6482 | -30.5683 | -16.1019 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9149 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9149 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 40.2294 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 40.2294 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C5 | 7355 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.05 |
| Bottom | 3054 | 0.62 | 0.062 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 172.4504 | 12.8488 | -29.867 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 229.3961 | -27.3458 | 25.8588 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 9.3922 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 9.3922 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 8.9719 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 8.9719 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C6 | 7356 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.276 |
| Bottom | 3054 | 0.62 | 0.09 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 166.535 | -29.3349 | -151.3574 | 3100 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 361.066 | 10.6635 | -53.3316 | 1240 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 7.9635 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 7.9635 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 40.917 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 40.917 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C7 | 7357 | C5 (16F-26F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.115 |
| Bottom | 3054 | 0.62 | 0.083 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 144.3449 | 47.1467 | 54.3628 | 3100 | 202] 1.5 [DL + RSX] |
| Bottom | 249.899 | -47.3495 | -30.4991 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.897 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.897 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 22.3565 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 22.3565 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C8 | 7358 | C6 (18F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.276 |
| Bottom | 3054 | 0.62 | 0.091 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 169.5473 | -32.8824 | 151.3923 | 3100 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 362.3282 | 12.1629 | 54.5165 | 1240 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 14.3496 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 14.3496 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 41.8253 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 41.8253 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C9 | 7359 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.252 |
| Bottom | 2688 | 0.75 | 0.256 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1090.6156 | -28.5741 | 0.4147 | 1860 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1110.6977 | -29.1003 | -1.7871 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.5359 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.5359 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.769 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 1.769 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C10 | 7360 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.346 |
| Bottom | 2688 | 0.75 | 0.349 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1500.0695 | -39.3018 | -0.7975 | 1860 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1513.4576 | -2.0112 | 39.6526 | 620 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.3605 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.3605 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.5712 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.5712 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C11 | 7361 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.225 |
| Bottom | 2688 | 0.75 | 0.176 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 728.5744 | 83.3948 | -19.0886 | 3100 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 748.6564 | 29.2419 | 19.6148 | 1240 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.9344 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.9344 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 21.3893 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 21.3893 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C12 | 7362 | C11 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.211 |
| Bottom | 2688 | 0.75 | 0.193 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 808.1465 | 55.451 | -21.1734 | 3100 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 841.6166 | 22.0504 | 1.7568 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.5942 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.5942 | 1240 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.6116 | 3100 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.6116 | 1240 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C13 | 7591 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.814 |
| Bottom | 1609 | 0.67 | 0.308 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 221.2009 | -8.9589 | 253.3669 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 244.594 | 18.3901 | -102.7122 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 117.0992 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 117.0992 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.7613 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.7613 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C14 | 7593 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.236 |
| Bottom | 1609 | 0.67 | 0.159 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 83.2184 | 1.6644 | 77.2835 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 107.0614 | 2.3339 | -59.2362 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 28.9041 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 28.9041 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.1667 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.1667 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C15 | 7596 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.195 |
| Bottom | 1609 | 0.67 | 0.319 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 145.2783 | 7.1798 | 69.6541 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 168.6714 | -8.1377 | -110.8029 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 61.6681 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 61.6681 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.4276 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.4276 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C16 | 7598 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.663 |
| Bottom | 1609 | 0.67 | 0.418 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 146.8719 | -4.1299 | 201.4998 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 170.265 | 7.7811 | -138.7556 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 112.1707 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 112.1707 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2658 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.2658 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C18 | 7600 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.201 |
| Bottom | 1609 | 0.67 | 0.122 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 79.7846 | -1.5957 | -67.4564 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 103.6275 | 2.0726 | 47.2198 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.9479 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 20.9479 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2062 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2062 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C17 | 7603 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.331 |
| Bottom | 1609 | 0.67 | 0.121 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.1303 | -2.7742 | 101.9864 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 236.1723 | 6.7796 | -46.9626 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.4966 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.4966 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.5429 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.5429 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C20 | 7606 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.78 |
| Bottom | 1609 | 0.67 | 0.295 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 227.945 | 6.8433 | 246.4274 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 251.3381 | -17.7377 | -100.0904 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 113.0977 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 113.0977 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.3439 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.3439 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C19 | 7608 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.339 |
| Bottom | 1609 | 0.67 | 0.131 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 71.697 | 2.1703 | 104.6629 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 242.2844 | -5.8203 | -53.8628 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 46.5035 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 46.5035 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.7313 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.7313 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C21 | 7611 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.816 |
| Bottom | 1609 | 0.67 | 0.32 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 233.1276 | -6.6964 | -257.0102 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 256.5207 | 17.3448 | 109.4588 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 121.278 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 121.278 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.0231 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.0231 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C22 | 7613 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.252 |
| Bottom | 1609 | 0.67 | 0.124 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 80.5472 | -1.6109 | 81.0377 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 104.3901 | -2.0878 | -47.9543 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 24.7844 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 24.7844 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2685 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2685 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C23 | 7616 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.755 |
| Bottom | 1609 | 0.67 | 0.436 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 151.6296 | 3.8199 | -226.7645 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 175.0227 | -6.7799 | 145.2535 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 124.5274 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 124.5274 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.743 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.743 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C24 | 7618 | C2 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.278 |
| Bottom | 1609 | 0.67 | 0.165 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 102.5172 | -2.0503 | -91.9601 | 2650 | 202] 1.5 [DL + RSX] |
| Bottom | 126.3601 | 2.5272 | 62.4776 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 34.8619 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 34.8619 | 1060 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2952 | 2650 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2952 | 1060 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C25 | 7622 | C3 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.173 |
| Bottom | 1609 | 0.67 | 0.302 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 305.0959 | -7.5158 | -58.5192 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 210.9848 | 7.4476 | 110.8157 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 57.7693 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 57.7693 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.1377 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.1377 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C26 | 7624 | C1 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.8 |
| Bottom | 1609 | 0.67 | 0.301 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 251.8373 | 8.5139 | -255.7096 | 2600 | 203] 1.5 [DL + RSY] |
| Bottom | 275.2304 | -18.0367 | 103.8337 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 119.1625 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 119.1625 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 8.9433 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 8.9433 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C27 | 7626 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.354 |
| Bottom | 1609 | 0.67 | 0.139 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 73.995 | 2.7175 | -109.1022 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 245.4425 | -6.5764 | 57.9047 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.9801 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 52.9801 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.3877 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.3877 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C28 | 7630 | C4 (24F-28F) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.383 |
| Bottom | 1609 | 0.67 | 0.153 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 75.1608 | -2.9185 | -116.6902 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 173.4644 | 5.863 | 65.5935 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 59.3759 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 59.3759 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.8818 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.8818 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C29 | 7634 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.349 |
| Bottom | 1609 | 0.67 | 0.209 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 45.2641 | -6.2458 | -97.0039 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 130.5116 | 8.835 | -70.4242 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 50.3687 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 50.3687 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.1185 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.1185 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C30 | 7636 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.32 |
| Bottom | 1609 | 0.67 | 0.233 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 48.0834 | 5.8619 | -90.141 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 135.1405 | -8.4456 | -79.2605 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 56.2647 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 56.2647 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.7806 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.7806 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C31 | 7638 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.337 |
| Bottom | 1609 | 0.67 | 0.289 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 56.7894 | -6.9462 | -95.4335 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 148.8615 | 10.0201 | 96.4534 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 68.5421 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 68.5421 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.8113 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.8113 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C32 | 7640 | C7 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.322 |
| Bottom | 1609 | 0.67 | 0.253 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 53.9106 | 5.9919 | -91.8773 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 143.9246 | -8.5145 | 86.5567 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 63.5367 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 63.5367 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 5.8516 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 5.8516 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C33 | 7642 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.335 |
| Bottom | 2545 | 0.85 | 0.361 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1216.8511 | -24.337 | 4.4802 | 1560 | 202] 1.5 [DL + RSX] |
| Bottom | 1234.3959 | 24.6879 | 96.4437 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 62.2493 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 62.2493 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.671 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.671 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C35 | 7648 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.329 |
| Bottom | 2545 | 0.85 | 0.319 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1051.011 | -21.0202 | -116.2609 | 2600 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1074.404 | 21.4881 | 92.3145 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 93.4915 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 93.4915 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.7764 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.7764 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C34 | 7650 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.265 |
| Bottom | 2545 | 0.85 | 0.262 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 915.8819 | 18.3176 | 65.4977 | 2600 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 939.2749 | -18.7855 | -49.8479 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 45.5195 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 45.5195 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.6832 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.6832 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C36 | 7654 | C9 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.315 |
| Bottom | 2545 | 0.85 | 0.316 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1097.9355 | 21.9587 | 73.4332 | 2600 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 1121.3286 | 22.4266 | -65.7611 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 55.351 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 55.351 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.9106 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.9106 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C37 | 7658 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.678 |
| Bottom | 1609 | 0.67 | 0.284 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 192.7304 | 68.9855 | 124.7655 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 216.1235 | -26.0642 | -78.3917 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 83.1783 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 83.1783 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 3.9854 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 3.9854 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C38 | 7661 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.691 |
| Bottom | 1609 | 0.67 | 0.292 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 204.0416 | -68.1801 | 133.5411 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 227.4346 | 25.5186 | -84.2875 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 91.8795 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 91.8795 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.407 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.407 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C39 | 7664 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.607 |
| Bottom | 3663 | 0.65 | 0.128 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 199.716 | 213.0158 | -33.1191 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 486.7987 | -62.5551 | 26.4195 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 17.592 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 17.592 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 85.6991 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 85.6991 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C40 | 7666 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.604 |
| Bottom | 3663 | 0.65 | 0.145 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 226.6883 | -215.1702 | -39.2507 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 544.0832 | 71.1716 | 28.2198 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 20.2591 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 20.2591 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 89.6781 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 89.6781 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C41 | 7668 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.626 |
| Bottom | 3663 | 0.65 | 0.131 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 198.4149 | 218.6037 | 33.041 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 484.3593 | -65.4034 | -25.1221 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 16.585 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 16.585 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 88.3618 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 88.3618 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C42 | 7670 | C10 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.627 |
| Bottom | 3663 | 0.65 | 0.136 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 207.4392 | -219.1731 | 41.4135 | 2600 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 509.1089 | 67.1037 | -26.4058 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 21.5008 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 21.5008 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 89.4148 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 89.4148 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C43 | 7672 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.356 |
| Bottom | 1609 | 0.67 | 0.37 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 955.5173 | 19.1103 | 46.8896 | 1560 | 202] 1.5 [DL + RSX] |
| Bottom | 969.5531 | -19.3911 | 57.4925 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.67 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 23.67 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 6.4763 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 6.4763 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| TF(+86.4) | C44 | 7674 | C8 (24F-HRF) | 3100 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.576 |
| Bottom | 1609 | 0.67 | 0.277 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 221.475 | -50.5127 | -133.7908 | 2600 | 202] 1.5 [DL + RSX] |
| Bottom | 244.8681 | 20.6634 | 88.6146 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 92.5841 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 92.5841 | 1040 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 4.2633 | 2600 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 4.2633 | 1040 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C2 | 7689 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.157 |
| Bottom | 3054 | 0.62 | 0.222 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 89.5334 | -5.2426 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 115.9488 | 123.1426 | -7.1008 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7525 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.7525 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7752 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.7752 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C4 | 7690 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.157 |
| Bottom | 3054 | 0.62 | 0.224 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 90.282 | -3.6632 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 115.9488 | 124.1751 | -4.9315 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5126 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.5126 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.903 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.903 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C6 | 7691 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.224 |
| Bottom | 3054 | 0.62 | 0.309 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 18.528 | -116.4075 | 1920 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 115.9488 | 25.1021 | -157.6894 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.7154 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.7154 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.7321 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.7321 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C8 | 7692 | C6 (18F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.223 |
| Bottom | 3054 | 0.62 | 0.307 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 94.787 | 19.2879 | 115.7893 | 1920 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 115.9488 | 26.1235 | 156.88 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4027 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.4027 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 13.8608 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 13.8608 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C9 | 7693 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.27 |
| Bottom | 2688 | 0.75 | 0.219 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 823.0538 | 108.5826 | -21.7286 | 3200 | 202] 1.5 [DL + RSX] |
| Bottom | 952.0228 | -1.9734 | 25.1334 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.5535 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.5535 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.3866 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 13.3866 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C10 | 7694 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.539 |
| Bottom | 2688 | 0.75 | 0.335 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1281.9794 | 258.6933 | -33.8443 | 3200 | 202] 1.5 [DL + RSX] |
| Bottom | 1449.5879 | -44.0483 | 38.2691 | 0 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.0173 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.0173 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 68.4111 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 68.4111 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C11 | 7695 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.254 |
| Bottom | 2688 | 0.75 | 0.346 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 550.5377 | 90.75 | -73.3676 | 1920 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 571.2675 | 143.5332 | -76.1302 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 6.0653 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 6.0653 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.7933 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.7933 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C12 | 7696 | C11 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.293 |
| Bottom | 2688 | 0.75 | 0.339 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 679.1121 | 96.5144 | -90.5021 | 1920 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 699.842 | 125.0026 | 93.2647 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 7.9855 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 7.9855 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.9775 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.9775 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C13 | 7824 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.903 |
| Bottom | 1609 | 0.67 | 0.86 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 51.8935 | 1.0746 | 238.8008 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 66.4692 | 4.5894 | 230.7064 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 4.4398 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 4.4398 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.8309 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.8309 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C14 | 7826 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.069 |
| Bottom | 1609 | 0.67 | 0.075 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | -0.3097 | 20.9366 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 39.7758 | 5.6219 | 20.7902 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0751 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0751 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$/s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3647 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3647 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C15 | 7829 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.746 |
| Bottom | 1609 | 0.67 | 0.318 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 17.5486 | 0.351 | 191.0302 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 41.8414 | -0.8368 | -89.9705 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 85.4535 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 85.4535 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2113 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.2113 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C16 | 7831 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.692 |
| Bottom | 1609 | 0.67 | 0.503 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 10.4878 | 0.7576 | 175.614 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 25.0635 | 3.2983 | 131.1665 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 23.0386 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 23.0386 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.2867 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.2867 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C18 | 7833 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.069 |
| Bottom | 1609 | 0.67 | 0.075 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.4829 | -0.3097 | -20.9381 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 39.7758 | 5.7004 | -20.6977 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0468 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0468 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3872 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3872 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C17 | 7836 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.183 |
| Bottom | 1609 | 0.67 | 0.178 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | -4.0267 | -0.2126 | 45.7765 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 5.2728 | -1.0524 | -46.1859 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.4989 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.4989 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3266 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3266 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C20 | 7839 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.883 |
| Bottom | 1609 | 0.67 | 0.826 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 56.3857 | -1.3552 | 234.8288 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 70.9614 | -5.7498 | 223.2568 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.402 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.402 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.2161 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.2161 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C19 | 7841 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.192 |
| Bottom | 1609 | 0.67 | 0.184 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | -3.6855 | 0.1804 | 48.0082 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 5.1065 | 0.9708 | -47.8266 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.467 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.467 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2634 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.2634 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C21 | 7844 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.896 |
| Bottom | 1609 | 0.67 | 0.835 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 58.3694 | 1.4059 | -238.5616 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 72.9451 | 5.9884 | -225.9333 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.7019 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.7019 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.29 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.29 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C22 | 7846 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.071 |
| Bottom | 1609 | 0.67 | 0.075 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 25.2151 | 0.6154 | 23.3144 | 1620 | 202] 1.5 [DL + RSX] |
| Bottom | 39.7908 | 5.6155 | 20.7872 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0697 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0697 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3639 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3639 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C23 | 7849 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.812 |
| Bottom | 1609 | 0.67 | 0.604 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 15.0357 | -0.707 | -206.8845 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 29.6114 | -3.0778 | -157.5523 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 25.7996 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 25.7996 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.17 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.17 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C24 | 7851 | C2 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.071 |
| Bottom | 1609 | 0.67 | 0.075 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 25.2001 | 0.6328 | -23.318 | 1620 | 202] 1.5 [DL + RSX] |
| Bottom | 39.7758 | 5.7057 | -20.6605 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 0.0407 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 0.0407 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.3886 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.3886 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C25 | 7855 | C3 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.976 |
| Bottom | 1609 | 0.67 | 0.398 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 46.232 | -0.9246 | -255.5466 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 70.5248 | 1.4105 | 117.2004 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 119.9685 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 119.9685 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4306 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4306 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C26 | 7857 | C1 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.871 |
| Bottom | 1609 | 0.67 | 0.821 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 58.6937 | -2.0321 | -232.0326 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 73.2694 | -8.6792 | -222.6033 | 1080 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.0635 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.0635 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 2.7938 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 2.7938 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C27 | 7859 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.204 |
| Bottom | 1609 | 0.67 | 0.178 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | -2.7218 | 0.2331 | -51.3059 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 5.5751 | 1.1714 | 46.361 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.0998 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.0998 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3706 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3706 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C28 | 7863 | C4 (24F-28F) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 27386.13 | 30 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.221 |
| Bottom | 1609 | 0.67 | 0.184 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | -0.7363 | -0.1871 | -56.2477 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 0.877 | -0.6482 | -46.7706 | 1080 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 6.8566 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 6.8566 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2888 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.2888 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C29 | 7867 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.225 |
| Bottom | 1609 | 0.67 | 0.224 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | -12.1225 | 0.2425 | -53.2113 | 2700 | 203] 1.5 [DL + RSY] |
| Bottom | 2.4532 | 0.835 | -56.2052 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.4518 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 8.4518 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3059 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3059 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C30 | 7869 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.203 |
| Bottom | 1609 | 0.67 | 0.203 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | -0.1242 | -0.7298 | -50.3523 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 4.7344 | -0.9782 | -51.5532 | 1080 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 8.694 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 8.694 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3697 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3697 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C31 | 7871 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.166 |
| Bottom | 1609 | 0.67 | 0.173 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 2.0836 | 0.7098 | 41.7718 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 16.6593 | 1.4351 | 47.173 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 7.8689 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 7.8689 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3462 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3462 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C32 | 7873 | C7 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.189 |
| Bottom | 1609 | 0.67 | 0.19 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 1.3706 | -0.566 | 47.2873 | 1620 | 203] 1.5 [DL + RSY] |
| Bottom | 15.9463 | -1.1407 | 51.4044 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 9.0644 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 9.0644 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2652 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.2652 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C33 | 7875 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.441 |
| Bottom | 2545 | 0.85 | 0.376 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 974.2022 | 26.5233 | -249.0976 | 2500 | 203] 1.5 [DL + RSY] |
| Bottom | 1002.3189 | -20.0464 | 186.1004 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 151.5946 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 151.5946 | 1000 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 15.2543 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 15.2543 | 1000 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C35 | 7881 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.869 |
| Bottom | 2545 | 0.85 | 0.78 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 936.3271 | -184.8066 | 172.1669 | 2700 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 950.9028 | -187.6835 | 72.793 | 1080 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 88.0104 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 88.0104 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 2.5013 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 2.5013 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C34 | 7883 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.668 |
| Bottom | 2545 | 0.85 | 0.643 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 790.3819 | -156.0008 | 81.1444 | 2700 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 814.6748 | -160.7956 | -36.9356 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 42.8046 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 42.8046 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.5094 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.5094 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C36 | 7887 | C9 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.387 |
| Bottom | 2545 | 0.85 | 0.299 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 897.2669 | -18.0987 | -219.4895 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 1002.9545 | 20.0591 | -88.1413 | 1080 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 53.4009 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 53.4009 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 5.9969 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 5.9969 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C37 | 7891 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.91 |
| Bottom | 1609 | 0.67 | 0.891 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 71.2651 | 80.2065 | 143.9961 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 55.4805 | 88.5749 | 65.6533 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 18.8428 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 18.8428 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 1.0578 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 1.0578 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C38 | 7893 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.901 |
| Bottom | 1609 | 0.67 | 0.882 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 73.7212 | -79.603 | 143.0184 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 88.2969 | -84.4227 | 123.3799 | 1080 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.3909 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 20.3909 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6035 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6035 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C39 | 7895 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.633 |
| Bottom | 3663 | 0.65 | 0.838 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 204.2616 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 268.4625 | -7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0505 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0505 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 26.4126 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 26.4126 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C40 | 7896 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.633 |
| Bottom | 3663 | 0.65 | 0.838 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 204.2289 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 268.4234 | -7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0734 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0734 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 26.4086 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 26.4086 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C41 | 7897 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.649 |
| Bottom | 3663 | 0.65 | 0.86 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 209.1555 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 274.8364 | 7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.076 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.076 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 27.0352 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 27.0352 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C42 | 7898 | C10 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.648 |
| Bottom | 3663 | 0.65 | 0.858 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 108.328 | 208.8697 | -5.7486 | 1920 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 132.5129 | 274.4643 | 7.032 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0717 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0717 | 1280 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 26.9988 | 3200 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 26.9988 | 1280 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C43 | 7899 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.697 |
| Bottom | 1609 | 0.67 | 0.402 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 744.0401 | -35.6768 | -251.289 | 2500 | 203] 1.5 [DL + RSY] |
| Bottom | 841.8645 | 26.5484 | 103.9358 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 116.2481 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 116.2481 | 1000 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 17.2965 | 2500 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 17.2965 | 1000 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR+OHT(+89.6) | C44 | 7900 | C8 (24F-HRF) | 3200 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.688 |
| Bottom | 1609 | 0.67 | 0.652 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.923 | 55.7428 | -126.5375 | 2700 | 202] 1.5 [DL + RSX] |
| Bottom | 84.4987 | 60.8895 | -103.7778 | 1080 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 17.3972 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 17.3972 | 1080 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.8846 | 2700 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.8846 | 1080 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C2 | 7922 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.071 |
| Bottom | 3054 | 0.62 | 0.114 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 43.4466 | -2.6254 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 80.6792 | 67.1688 | -4.0074 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.6078 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.6078 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.5317 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.5317 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C4 | 7923 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.071 |
| Bottom | 3054 | 0.62 | 0.114 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 43.8069 | -1.8582 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 80.6792 | 67.7251 | -2.822 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.4229 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.4229 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.6264 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.6264 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C6 | 7924 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.106 |
| Bottom | 3054 | 0.62 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 9.2873 | -58.3607 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 80.6792 | 14.1559 | -88.9448 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.5759 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.5759 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.4968 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.4968 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C8 | 7925 | C6 (18F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.106 |
| Bottom | 3054 | 0.62 | 0.167 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 61.1707 | 9.6739 | 58.0299 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 80.6792 | 14.7401 | 88.4541 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3278 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.3278 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 10.5892 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 10.5892 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C9 | 7926 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.193 |
| Bottom | 2688 | 0.75 | 0.325 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 507.8279 | -72.9643 | 40.2667 | 1770 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 526.9382 | -146.9425 | 54.4942 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.1686 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.1686 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 33.3485 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 33.3485 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C10 | 7927 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.255 |
| Bottom | 2688 | 0.75 | 0.392 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 611.2388 | -106.33 | 48.4663 | 1770 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 400.3848 | -168.474 | 61.806 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 13.9587 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 13.9587 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.6092 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 23.6092 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C11 | 7928 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.31 |
| Bottom | 2688 | 0.75 | 0.247 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 504.8671 | -129.2961 | -67.2813 | 2950 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 523.9775 | -89.6309 | -69.828 | 1180 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 3.9483 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 3.9483 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.7897 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.7897 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C12 | 7929 | C11 (24F-28F) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.284 |
| Bottom | 2688 | 0.75 | 0.273 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 664.6136 | -92.2619 | -88.5699 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 683.7239 | -91.1167 | -76.8625 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 5.9241 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 5.9241 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.9652 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.9652 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C33 | 7982 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.495 |
| Bottom | 2545 | 0.85 | 0.615 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 659.628 | -66.7284 | 227.9157 | 1470 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 473.1644 | -51.8481 | 327.507 | 0 | 203] 1.5 [DL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 52.6445 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 52.6445 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 3.3105 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 3.3105 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C35 | 7987 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.709 |
| Bottom | 2545 | 0.85 | 0.838 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 682.0902 | 134.6269 | 196.817 | 2450 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 526.9992 | 104.0159 | -353.5989 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 193.9827 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 193.9827 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.9483 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 6.9483 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C34 | 7989 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.684 |
| Bottom | 2545 | 0.85 | 0.566 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 673.0278 | -132.8382 | -179.8799 | 2450 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 686.2539 | 135.4487 | -56.0715 | 980 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 89.5734 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 89.5734 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 7.696 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 7.696 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C36 | 7992 | C9 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.255 |
| Bottom | 2545 | 0.85 | 0.397 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 652.6308 | 20.3512 | -122.6217 | 2450 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 315.518 | 15.3318 | 242.5102 | 0 | 202] 1.5 [DL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 135.7342 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 135.7342 | 980 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 6.7756 | 2450 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 6.7756 | 980 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C37 | 7996 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.513 |
| Bottom | 1609 | 0.67 | 0.767 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | 53.0581 | 3.0768 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | 78.5851 | 4.8856 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.7597 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.7597 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5187 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5187 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C38 | 7997 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.509 |
| Bottom | 1609 | 0.67 | 0.762 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | -52.7286 | 3.5295 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | -78.0943 | 5.5645 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.7548 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.7548 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.5889 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.5889 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C39 | 7998 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.329 |
| Bottom | 3663 | 0.65 | 0.496 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 108.6069 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 161.3543 | 4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0373 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0373 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.3221 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.3221 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C40 | 7999 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.329 |
| Bottom | 3663 | 0.65 | 0.496 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 108.5869 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 161.3264 | 4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0568 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0568 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.3177 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.3177 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C41 | 8000 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.338 |
| Bottom | 3663 | 0.65 | 0.509 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 111.2498 | -3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 165.2545 | -4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0578 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0578 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.887 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.887 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C42 | 8001 | C10 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.337 |
| Bottom | 3663 | 0.65 | 0.508 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 69.9094 | 111.0956 | 3.6749 | 1770 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 92.2048 | 165.0269 | -4.8469 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0543 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0543 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 23.854 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 23.854 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C43 | 8002 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.31 |
| Bottom | 1609 | 0.67 | 0.451 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | -33.7195 | -3.2197 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | -48.4418 | -5.0059 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.4822 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.4822 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.4332 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.4332 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| MR ROOF(+92.55) | C44 | 8003 | C8 (24F-HRF) | 2950 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.34 |
| Bottom | 1609 | 0.67 | 0.511 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 29.9612 | 36.5224 | -4.4121 | 1770 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 39.5163 | 54.1729 | -6.8709 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 3.7986 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 3.7986 | 1180 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.6261 | 2950 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.6261 | 1180 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C2 | 8029 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.016 |
| Bottom | 3054 | 0.62 | 0.042 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 10.9888 | -0.6758 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 48.165 | 27.6977 | -1.7093 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.3068 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.3068 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0009 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.0009 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C4 | 8030 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.017 |
| Bottom | 3054 | 0.62 | 0.042 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 11.0823 | -0.6179 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 48.165 | 27.925 | 1.5448 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2187 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.2187 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0445 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.0445 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C6 | 8031 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.026 |
| Bottom | 3054 | 0.62 | 0.066 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 2.403 | -15.1221 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 48.165 | 6.0562 | -38.0514 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.2899 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.2899 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 4.9833 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 4.9833 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C8 | 8032 | C6 (18F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 700 | 700 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3054 | 0.62 | 0.026 |
| Bottom | 3054 | 0.62 | 0.066 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 19.266 | 2.5057 | 15.0328 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 48.165 | 6.31 | 37.827 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 0.1677 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 0.1677 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 775.9 | 5.0241 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 775.9 | 5.0241 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C9 | 8033 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.461 |
| Bottom | 2688 | 0.75 | 0.243 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 375.9602 | 204.7381 | -49.6499 | 4370 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 476.2148 | 111.2574 | -37.76 | 1748 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 8.6317 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 8.6317 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 33.3457 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 33.3457 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C10 | 8034 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_C$ | $\gamma_S$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.298 |
| Bottom | 2688 | 0.75 | 0.209 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 583.0145 | 108.5829 | -83.3389 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 598.4986 | -71.6043 | 47.4562 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 11.6856 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 11.6856 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 23.6081 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 23.6081 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C11 | 8035 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.501 |
| Bottom | 2688 | 0.75 | 0.373 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 457.6851 | -221.96 | -60.9936 | 4370 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 485.9943 | -166.6954 | -64.7662 | 1748 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 1.983 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 1.983 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 20.78 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 20.78 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C12 | 8036 | C11 (24F-28F) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 600 | 600 | 15.3 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2688 | 0.75 | 0.373 |
| Bottom | 2688 | 0.75 | 0.315 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 617.4315 | -135.5106 | -103.8503 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 645.7407 | -109.8308 | -94.3215 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 4.1048 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 4.1048 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 665.06 | 10.9401 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 665.06 | 10.9401 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C33 | 8084 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.604 |
| Bottom | 2545 | 0.85 | 0.367 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 446.2846 | 95.3503 | -215.8558 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 481.1043 | -56.5293 | -151.1745 | 0 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 26.6071 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 26.6071 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 20.7621 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 20.7621 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C35 | 8089 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.805 |
| Bottom | 2545 | 0.85 | 0.51 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 420.0977 | -137.6229 | -211.3114 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 473.8651 | 100.5224 | -120.9419 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 30.3011 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 30.3011 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 22.3364 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 22.3364 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C34 | 8091 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.75 |
| Bottom | 2545 | 0.85 | 0.547 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 489.3103 | 154.2472 | 99.9843 | 3870 | 204] 1.2 [DL + LL + RSX] |
| Bottom | 524.13 | -109.5245 | 124.7833 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 20.6246 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 20.6246 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 20.5707 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 20.5707 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C36 | 8094 | C9 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 1000 | 14 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 2545 | 0.85 | 0.487 |
| Bottom | 2545 | 0.85 | 0.232 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 375.3122 | -71.6131 | 189.0674 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 452.6968 | 41.119 | 74.51 | 0 | 204] 1.2 [DL + LL + RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 39.5734 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 39.5734 | 1548 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1108.43 | 22.4521 | 3870 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1108.43 | 22.4521 | 1548 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C37 | 8098 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.139 |
| Bottom | 1609 | 0.67 | 0.352 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | 14.5393 | 0.7322 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | 36.8451 | 1.8894 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.6713 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.6713 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.2945 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.2945 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C38 | 8099 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.138 |
| Bottom | 1609 | 0.67 | 0.35 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | -14.4524 | 0.8526 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | -36.6221 | 2.192 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.6591 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.6591 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.34 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.34 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C39 | 8100 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.086 |
| Bottom | 3663 | 0.65 | 0.218 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 29.1417 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 73.5776 | 3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0171 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0171 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.242 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 13.242 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C40 | 8101 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.086 |
| Bottom | 3663 | 0.65 | 0.218 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 29.1356 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 73.5631 | 3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0271 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0271 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.2391 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 13.2391 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C41 | 8102 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.089 |
| Bottom | 3663 | 0.65 | 0.224 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 29.8605 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 75.3821 | -3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.027 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.027 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.5699 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 13.5699 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C42 | 8103 | C10 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 400 | 1400 | 15.8 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 3663 | 0.65 | 0.088 |
| Bottom | 3663 | 0.65 | 0.224 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 22.0183 | 29.8185 | -1.22 | 2622 | 207] [0.9 DL + 1.5 RSY] |
| Bottom | 55.0457 | 75.2769 | 3.0499 | 0 | 207] [0.9 DL + 1.5 RSY] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 443.37 | 0.0253 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 443.37 | 0.0253 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 1551.81 | 13.5507 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 1551.81 | 13.5507 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C43 | 8104 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.089 |
| Bottom | 1609 | 0.67 | 0.225 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | -9.7978 | -0.8085 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | -24.6642 | -2.0384 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.5088 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.5088 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.29 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.29 | 1748 | 205] 1.2 [DL + LL + RSY] |

# ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Column Section Design(Envelope)

**Column Element Details**

| Level | Element | Unique Name | Section ID | Length (mm) | LLRF |
|---|---|---|---|---|---|
| HELIPAD(+96.92) | C44 | 8105 | C8 (24F-HRF) | 4370 | 1 |

**Section Properties**

| b (mm) | h (mm) | dc (mm) | Cover (Torsion) (mm) |
|---|---|---|---|
| 300 | 800 | 13 | -10 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 25000 | 25 | 1 | 500 | 500 |

**Design Code Parameters**

| $\gamma_c$ | $\gamma_s$ |
|---|---|
| 1.5 | 1.15 |

**Longitudinal Check for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Rebar Area mm² | Rebar % | D/C Ratio |
|---|---|---|---|
| Top | 1609 | 0.67 | 0.092 |
| Bottom | 1609 | 0.67 | 0.234 |

**Design Axial Force & Biaxial Moment for $P_u$ - $M_{u2}$ - $M_{u3}$ Interaction**

| Column End | Design $P_u$ kN | Design $M_{u2}$ kN-m | Design $M_{u3}$ kN-m | Station Loc mm | Controlling Combo |
|---|---|---|---|---|---|
| | kN | kN-m | kN-m | mm | |
| Top | 9.4364 | 10.0779 | -1.0965 | 2622 | 206] [0.9 DL + 1.5 RSX] |
| Bottom | 23.591 | 25.5496 | -2.7878 | 0 | 206] [0.9 DL + 1.5 RSX] |

**Shear Reinforcement for Major Shear, $V_{u2}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u2}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 332.53 | 1.6846 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 332.53 | 1.6846 | 1748 | 205] 1.2 [DL + LL + RSY] |

**Shear Reinforcement for Minor Shear, $V_{u3}$**

| Column End | Rebar $A_{sv}$ /s mm²/m | Design $V_{u3}$ kN | Station Loc mm | Controlling Combo |
|---|---|---|---|---|
| Top | 886.75 | 0.3576 | 4370 | 205] 1.2 [DL + LL + RSY] |
| Bottom | 886.75 | 0.3576 | 1748 | 205] 1.2 [DL + LL + RSY] |

# 1 Design Data

This chapter provides design data and results.

## 1.1 Shear Wall Design

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.986 | 202] 1.5 [DL + RSX] | 1564.6638 | -69.7098 | -241.1612 |
| Bottom | 0.807 | 202] 1.5 [DL + RSX] | 1607.1762 | 65.9263 | 45.0068 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1422.3062 | -189.3224 | 91.4358 | 136.741 | 396.5671 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1464.8187 | 59.8366 | 91.4624 | 138.0556 | 397.8816 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1623.5188 | -189.3224 | 7.14 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1666.0313 | -30.8954 | 5.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1666.0313 | 59.8366 | 5.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.901 | 202] 1.5 [DL + RSX] | 1777.6551 | -66.6391 | 115.1142 |
| Bottom | 0.862 | 202] 1.5 [DL + RSX] | 1820.1675 | 66.026 | -54.1062 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1583.337 | 128.8546 | -53.8907 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1625.8494 | 29.4295 | -54.1323 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1157.253 | -20.3698 | 3.5 | 5 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1842.4005 | 128.8546 | 6.91 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1884.913 | -75.3347 | 6.28 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1884.913 | 29.4295 | 5.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.946 | 202] 1.5 [DL + RSX] | 1998.8261 | -69.3171 | 90.053 |
| Bottom | 0.932 | 202] 1.5 [DL + RSX] | 2041.3386 | 67.6211 | -56.022 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1746.4491 | 99.8516 | -44.5374 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1788.9615 | 29.2077 | -44.8336 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2063.2911 | -30.5848 | 6.16 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2063.2911 | 99.8516 | 7.12 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2105.8036 | -83.2012 | 7.01 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2105.8036 | 29.2077 | 6.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.02 | 202] 1.5 [DL + RSX] | 2223.4373 | -71.7284 | 92.6506 |
| Bottom | 1.004 | 202] 1.5 [DL + RSX] | 2265.9497 | 69.7094 | -56.0238 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1910.9184 | 99.1396 | -43.7518 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1953.4309 | 31.5703 | -44.1064 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2285.5755 | -35.1224 | 6.84 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2285.5755 | 99.1396 | 7.73 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2328.088 | -85.6865 | 7.66 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2328.088 | 31.5703 | 6.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.096 | 202] 1.5 [DL + RSX] | 2450.1212 | -73.8941 | 96.9176 |
| Bottom | 1.078 | 202] 1.5 [DL + RSX] | 2492.6336 | 71.7804 | -57.9765 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2076.5564 | 100.1095 | -43.7756 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2119.0689 | 32.1381 | -44.1882 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2509.0118 | -34.3879 | 7.45 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2509.0118 | 100.1095 | 8.36 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2551.5242 | -87.0883 | 8.3 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2551.5242 | 32.1381 | 7.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.171 | 202] 1.5 [DL + RSX] | 2678.212 | -75.9666 | 99.912 |
| Bottom | 1.152 | 202] 1.5 [DL + RSX] | 2720.7245 | 73.8301 | -60.3193 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2243.0978 | 99.8376 | -43.712 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2285.6102 | 32.2511 | -44.1576 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2733.3168 | -33.5603 | 8.06 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2733.3168 | 99.8376 | 8.98 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2775.8292 | -87.9499 | 8.93 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2775.8292 | 32.2511 | 8.16 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.164 | 202] 1.5 [DL + RSX] | 2907.2409 | -77.8738 | 101.8274 |
| Bottom | 1.146 | 202] 1.5 [DL + RSX] | 2949.7533 | 75.8138 | -62.5321 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2410.2842 | 98.7095 | -43.647 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2452.7966 | 32.6469 | -44.0901 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2958.2138 | -32.2811 | 8.67 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2958.2138 | 98.7095 | 9.59 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3000.7262 | -88.9196 | 9.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3000.7262 | 32.6469 | 8.79 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.231 | 202] 1.5 [DL + RSX] | 3136.8029 | -79.5324 | 102.1131 |
| Bottom | 1.215 | 202] 1.5 [DL + RSX] | 3179.3154 | 77.6976 | -65.6044 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2577.8863 | 96.7913 | -43.4896 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2620.3987 | 33.3351 | -43.8947 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3183.4049 | -30.5451 | 9.27 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3183.4049 | 96.7913 | 10.19 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3225.9173 | -90.3727 | 10.22 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3225.9173 | 33.3351 | 9.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.333 | 202] 1.5 [DL + RSX] | 3366.4962 | -80.7864 | 100.111 |
| Bottom | 1.322 | 202] 1.5 [DL + RSX] | 3409.0086 | 79.3161 | -70.3107 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2787.7634 | 100.111 | -44.3702 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2830.2759 | 14.0715 | -44.5438 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3408.5497 | -28.9418 | 9.87 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3408.5497 | 94.2587 | 10.78 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3451.0622 | -91.396 | 10.86 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3451.0622 | 35.1568 | 10.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.396 | 202] 1.5 [DL + RSX] | 3595.8988 | -81.5913 | 96.3194 |
| Bottom | 1.397 | 202] 1.5 [DL + RSX] | 3638.4112 | 80.8474 | -76.3241 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2950.9394 | 96.3194 | -44.9111 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2993.4519 | 25.0088 | -45.0628 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3633.2428 | -27.1404 | 10.47 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3633.2428 | 92.6062 | 11.38 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3675.7552 | -90.6726 | 11.47 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3675.7552 | 39.3573 | 10.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.22 | 202] 1.5 [DL + RSX] | 3824.6926 | -81.4268 | 91.7349 |
| Bottom | 1.234 | 202] 1.5 [DL + RSX] | 3867.205 | 79.4868 | -128.213 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3114.0814 | 91.7349 | -59.2699 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3156.5939 | -2.6205 | -59.4067 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3857.2304 | -24.6124 | 11.06 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3857.2304 | 94.1191 | 12.02 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3899.7428 | -137.2866 | 12.74 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3899.7428 | 6.4531 | 10.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P1 | 0 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.28 | 202] 1.5 [DL + RSX] | 4053.4624 | -85.1411 | -55.7149 |
| Bottom | 1.433 | 202] 1.5 [DL + RSX] | 4095.9749 | 99.6171 | 304.5513 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3277.4951 | 40.573 | 102.961 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3320.0075 | 304.5513 | 103.0751 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4080.7514 | -65.9426 | 12.25 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4080.7514 | 50.8007 | 12.04 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4123.2639 | 290.2287 | 15.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.715 | 202] 1.5 [DL + RSX] | 4302.8319 | -177.127 | -938.6952 |
| Bottom | 1.382 | 202] 1.5 [DL + RSX] | 4366.6006 | 168.3787 | -151.7197 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3434.3704 | -714.4826 | 308.0319 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3498.1391 | 123.9242 | 308.1753 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4325.5674 | -708.0151 | 12.38 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4366.6006 | -151.7197 | 9.02 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4366.6006 | 123.9242 | 8.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.416 | 202] 1.5 [DL + RSX] | 4602.2552 | -167.0773 | 142.4367 |
| Bottom | 1.433 | 202] 1.5 [DL + RSX] | 4666.0239 | 168.9191 | -138.3921 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3570.9439 | 181.2435 | -79.5259 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3634.7126 | 199.9292 | -79.8571 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4643.1691 | -46.4373 | 8.89 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4643.1691 | 181.2435 | 9.72 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4706.9378 | -222.211 | 10.09 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4706.9378 | 199.9292 | 9.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.449 | 202] 1.5 [DL + RSX] | 4899.4908 | -160.9299 | 150.336 |
| Bottom | 1.474 | 202] 1.5 [DL + RSX] | 4963.2595 | 164.6316 | -154.8828 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3728.9077 | 191.8988 | -89.5136 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3792.6763 | 190.7123 | -90.058 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4958.4128 | -54.7095 | 9.52 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4958.4128 | 191.8988 | 10.37 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5022.1815 | -257.5626 | 10.89 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5022.1815 | 190.7123 | 10.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.481 | 202] 1.5 [DL + RSX] | 5193.1174 | -157.2348 | 126.3399 |
| Bottom | 1.513 | 202] 1.5 [DL + RSX] | 5256.8861 | 161.0327 | -154.3676 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3885.9441 | 169.1121 | -81.2093 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3949.7128 | 208.2809 | -81.9286 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5269.4355 | -79.4649 | 10.25 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5269.4355 | 169.1121 | 10.8 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5333.2042 | -270.2238 | 11.54 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5333.2042 | 208.2809 | 11.16 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.514 | 202] 1.5 [DL + RSX] | 5483.047 | -152.5316 | 119.7868 |
| Bottom | 1.553 | 202] 1.5 [DL + RSX] | 5546.8157 | 157.1407 | -164.0837 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4043.3185 | 169.2694 | -80.3134 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4107.0872 | 227.4316 | -81.1473 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5575.8945 | -78.4069 | 10.81 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5575.8945 | 169.2694 | 11.37 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5639.6631 | -287.1982 | 12.22 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5639.6631 | 227.4316 | 11.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.541 | 202] 1.5 [DL + RSX] | 5768.8088 | -146.6671 | 107.5168 |
| Bottom | 1.593 | 202] 1.5 [DL + RSX] | 5832.5775 | 152.3362 | -185.4581 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4201.9947 | 173.1063 | -79.0114 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4265.7633 | 248.0829 | -79.8847 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5876.9357 | -83.6229 | 11.4 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5876.9357 | 173.1063 | 11.95 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5940.7043 | -309.8865 | 12.91 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5940.7043 | 248.0829 | 12.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.577 | 202] 1.5 [DL + RSX] | 6049.5786 | -139.7191 | 94.0299 |
| Bottom | 1.635 | 202] 1.5 [DL + RSX] | 6113.3472 | 147.3192 | -218.7673 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4362.9772 | 184.9074 | -77.2789 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4426.7459 | 274.2706 | -78.109 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6171.3273 | -101.3285 | 12.05 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6171.3273 | 184.9074 | 12.57 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6235.096 | -339.2846 | 13.64 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6235.096 | 274.2706 | 13.24 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.607 | 202] 1.5 [DL + RSX] | 6324.1479 | -129.747 | 99.1185 |
| Bottom | 1.662 | 202] 1.5 [DL + RSX] | 6387.9166 | 137.1095 | -259.8903 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4660.6541 | 99.1185 | -75.6245 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4724.4227 | 199.9948 | -75.7281 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6457.3949 | -134.6086 | 12.79 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6457.3949 | 210.5694 | 13.26 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6521.1636 | -373.8353 | 14.38 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6521.1636 | 313.9398 | 14.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.653 | 202] 1.5 [DL + RSX] | 6592.1967 | -123.796 | 138.7758 |
| Bottom | 1.768 | 202] 1.5 [DL + RSX] | 6657.9898 | 151.0908 | -303.9361 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4838.7656 | 138.7758 | -71.3975 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4904.5587 | 278.7778 | -71.4745 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6734.8511 | -179.8082 | 13.58 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6734.8511 | 256.2103 | 14.05 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6800.6441 | -399.1359 | 15.06 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6800.6441 | 373.9776 | 14.9 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.06 | 202] 1.5 [DL + RSX] | 6876.687 | -251.1981 | 212.3835 |
| Bottom | 2.153 | 202] 1.5 [DL + RSX] | 6961.7119 | 253.6979 | 478.5678 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5046.6245 | 212.3835 | -65.0298 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5131.6494 | 478.5678 | -65.0824 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7026.0485 | -241.8649 | 14.5 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7026.0485 | 319.0705 | 14.98 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7111.0734 | -459.0274 | 16 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7111.0734 | 509.3865 | 16.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P1 | 0 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 0 | 0 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.036 | 202] 1.5 [DL + RSX] | 7105.9566 | -218.0696 | 400.6339 |
| Bottom | 2.129 | 202] 1.5 [DL + RSX] | 7187.3376 | 220.2616 | -707.8331 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5228.0135 | 400.6339 | -87.8885 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5309.3945 | 614.9199 | -87.8974 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7258.7537 | -391.088 | 15.86 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7258.7537 | 446.0238 | 16.2 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7340.1346 | -687.9913 | 17.84 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7340.1346 | 595.0781 | 17.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.22 | 203] 1.5 [DL + RSY] | 767.751 | 136.9132 | 70.8783 |
| Bottom | 1.55 | 203] 1.5 [DL + RSY] | 810.2635 | -115.5139 | 26.0744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 714.3603 | 171.5024 | -69.5741 | 111.3185 | 371.1446 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 756.8727 | 94.5794 | -69.9813 | 112.5926 | 372.4187 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 919.3629 | -44.1251 | 3.17 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 919.3629 | 171.5024 | 4.94 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 961.8754 | -60.5815 | 3.51 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 961.8754 | 94.5794 | 3.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.149 | 203] 1.5 [DL + RSY] | 1007.96 | 102.2278 | -58.8455 |
| Bottom | 1.131 | 203] 1.5 [DL + RSY] | 1050.4725 | -104.6517 | 39.0304 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 986.4788 | 48.2564 | 74.4816 | 119.4738 | 379.2999 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1028.9913 | 105.999 | 74.9548 | 120.7479 | 380.574 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1196.8489 | -155.5766 | 5.49 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1196.8489 | 48.2564 | 3.99 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1239.3613 | -41.2655 | 4.02 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1239.3613 | 105.999 | 4.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.142 | 203] 1.5 [DL + RSY] | 1481.334 | 108.8935 | -46.9059 |
| Bottom | 1.121 | 203] 1.5 [DL + RSY] | 1523.8464 | -106.9919 | 40.4452 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1253.5798 | 74.7337 | 75.5301 | 124.7667 | 384.5927 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1296.0922 | 114.7713 | 75.9748 | 126.0136 | 385.8397 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1473.3728 | -155.6675 | 6.25 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1473.3728 | 74.7337 | 5.13 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1515.8852 | -42.9618 | 4.81 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1515.8852 | 114.7713 | 5.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.153 | 203] 1.5 [DL + RSY] | 1785.993 | 107.8677 | -42.8952 |
| Bottom | 1.147 | 203] 1.5 [DL + RSY] | 1828.5055 | -107.0522 | 40.1302 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1517.7051 | 83.6799 | 75.3066 | 131.9947 | 391.8208 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1560.2175 | 117.5688 | 75.7382 | 131.9947 | 391.8208 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1785.993 | -30.7879 | 5.39 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1749.9884 | 83.6799 | 6.02 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1792.5008 | -46.8049 | 5.63 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1828.5055 | 40.1302 | 5.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.189 | 203] 1.5 [DL + RSY] | 2089.6993 | 108.4493 | -42.5469 |
| Bottom | 1.19 | 203] 1.5 [DL + RSY] | 2132.2118 | -107.6977 | 39.4185 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1779.3306 | 88.9834 | 76.4346 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1821.8431 | 119.871 | 76.8499 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2089.6993 | -30.622 | 6.23 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2026.9259 | 88.9834 | 6.87 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2069.4383 | -50.6303 | 6.45 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2132.2118 | 39.4185 | 6.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.254 | 203] 1.5 [DL + RSY] | 2393.121 | 108.9329 | -42.2553 |
| Bottom | 1.256 | 203] 1.5 [DL + RSY] | 2435.6335 | -108.4371 | 38.2847 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2039.1244 | 93.4993 | 77.816 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2081.6369 | 122.7018 | 78.2143 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2393.121 | -30.5632 | 7.07 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2304.6276 | 93.4993 | 7.7 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2347.14 | -54.8648 | 7.28 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2435.6335 | 38.2847 | 7.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.282 | 203] 1.5 [DL + RSY] | 2696.8367 | 109.5947 | -41.447 |
| Bottom | 1.29 | 203] 1.5 [DL + RSY] | 2739.3492 | -109.3719 | 37.2169 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2297.6484 | 97.0856 | 79.2323 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2340.1609 | 126.3789 | 79.6124 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2696.8367 | -30.5562 | 7.92 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2583.5506 | 97.0856 | 8.52 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2626.0631 | -59.8566 | 8.13 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2739.3492 | 37.2169 | 8.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.365 | 203] 1.5 [DL + RSY] | 3001.4087 | 110.3175 | -40.2198 |
| Bottom | 1.374 | 203] 1.5 [DL + RSY] | 3043.9211 | -110.4005 | 36.3097 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2555.4386 | 99.3115 | 80.4783 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2597.951 | 131.0131 | 80.838 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3001.4087 | -30.4689 | 8.76 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2864.1931 | 99.3115 | 9.34 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2906.7055 | -66.209 | 8.99 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3043.9211 | 36.3097 | 8.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.394 | 203] 1.5 [DL + RSY] | 3307.3832 | 111.1707 | -39.3392 |
| Bottom | 1.406 | 203] 1.5 [DL + RSY] | 3349.8956 | -111.7276 | 35.5345 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2813.0196 | 99.6986 | 81.5842 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2855.532 | 137.1364 | 81.9224 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3307.3832 | -29.9819 | 9.6 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3147.0964 | 99.6986 | 10.13 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3189.6089 | -74.65 | 9.9 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3349.8956 | 35.5345 | 9.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.475 | 203] 1.5 [DL + RSY] | 3615.2168 | 111.7588 | -39.7767 |
| Bottom | 1.486 | 203] 1.5 [DL + RSY] | 3657.7293 | -112.1396 | 37.9726 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3070.8333 | 97.6097 | 83.0922 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3113.3458 | 147.2297 | 83.4085 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3615.2168 | -28.4956 | 10.44 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3432.7719 | 97.6097 | 10.89 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3475.2844 | -81.8278 | 10.79 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3657.7293 | 37.9726 | 10.69 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.5 | 203] 1.5 [DL + RSY] | 3925.7228 | 114.0659 | -38.0092 |
| Bottom | 1.542 | 203] 1.5 [DL + RSY] | 3968.2352 | -116.9392 | 74.0645 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3329.677 | 96.9834 | 98.208 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3372.1894 | 204.9903 | 98.5083 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3925.7228 | -22.5504 | 11.22 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3722.1561 | 96.9834 | 11.69 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3764.6685 | -70.2825 | 11.43 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3764.6685 | 204.9903 | 13.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P2 | 5045 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 0 | 5645 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.556 | 203] 1.5 [DL + RSY] | 4238.3527 | 109.8881 | 16.896 |
| Bottom | 1.642 | 203] 1.5 [DL + RSY] | 4280.8651 | -103.7959 | -254.1403 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3588.9798 | 117.9058 | -152.3015 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3631.4922 | -50.1061 | -152.5043 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4014.7625 | -96.898 | 12.5 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4238.3527 | 16.896 | 12.01 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4280.8651 | -219.8689 | 14.95 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2519.5215 | 44.6958 | 7.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.412 | 203] 1.5 [DL + RSY] | 4515.241 | 99.4164 | 1000.366 |
| Bottom | 1.177 | 203] 1.5 [DL + RSY] | 4579.0097 | -98.7061 | 76.9013 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3816.1643 | 1006.8026 | -350.2638 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3879.933 | 288.8294 | -350.3736 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4515.241 | 1000.366 | 14.54 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4336.0609 | -180.4805 | 9.14 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4579.0097 | 76.9013 | 8.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.212 | 203] 1.5 [DL + RSY] | 4804.6104 | 96.1335 | 58.4027 |
| Bottom | 1.23 | 203] 1.5 [DL + RSY] | 4868.379 | -99.7437 | -40.8752 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4058.3299 | 171.6715 | -100.107 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4122.0985 | 225.602 | -100.3152 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4537.1045 | -99.7433 | 9.02 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4804.6104 | 58.4027 | 9.26 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4868.379 | -8.2101 | 9.07 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4600.8732 | 225.602 | 9.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.263 | 203] 1.5 [DL + RSY] | 5097.8048 | 93.8783 | -53.9733 |
| Bottom | 1.28 | 203] 1.5 [DL + RSY] | 5161.5735 | -98.3723 | -19.9481 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4303.9328 | 105.4771 | 91.4739 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4367.7014 | 262.1906 | 91.6531 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5097.8048 | -23.4209 | 9.58 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4807.2115 | 105.4771 | 9.55 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5161.5735 | -19.9481 | 9.68 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5161.5735 | 10.4868 | 9.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.312 | 203] 1.5 [DL + RSY] | 5392.5318 | 92.3193 | -32.7813 |
| Bottom | 1.334 | 203] 1.5 [DL + RSY] | 5456.3004 | -97.5621 | 14.7866 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4551.6484 | 132.7107 | 87.1207 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4615.4171 | 288.9207 | 87.3059 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5392.5318 | -4.1309 | 10.01 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5080.5914 | 132.7107 | 10.23 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5456.3004 | -11.5463 | 10.18 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5456.3004 | 14.7866 | 10.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.362 | 203] 1.5 [DL + RSY] | 5688.9383 | 90.1635 | -22.2852 |
| Bottom | 1.39 | 203] 1.5 [DL + RSY] | 5752.707 | -96.6223 | 14.1142 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4802.1879 | 147.3869 | 84.0915 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4865.9566 | 311.4267 | 84.3486 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5688.9383 | -22.2852 | 10.67 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5688.9383 | 2.4603 | 10.55 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5752.707 | -10.9255 | 10.72 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5752.707 | 14.1142 | 10.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.414 | 203] 1.5 [DL + RSY] | 5986.8727 | 87.4453 | 4.7409 |
| Bottom | 1.445 | 203] 1.5 [DL + RSY] | 6050.6414 | -95.3551 | 14.3052 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5056.0511 | 155.3205 | 82.9533 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5119.8198 | 336.4779 | 83.3337 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5986.8727 | -19.3068 | 11.21 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5986.8727 | 4.7409 | 11.12 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6050.6414 | -10.7241 | 11.27 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6050.6414 | 14.3052 | 11.29 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.477 | 203] 1.5 [DL + RSY] | 6286.2492 | 84.2275 | 8.125 |
| Bottom | 1.502 | 203] 1.5 [DL + RSY] | 6350.0178 | -94.1873 | 18.4053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5313.8917 | 164.2651 | 82.8944 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5377.6604 | 370.0994 | 83.3961 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6286.2492 | -16.1156 | 11.74 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6286.2492 | 8.125 | 11.69 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6350.0178 | -9.2033 | 11.82 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6350.0178 | 18.4053 | 11.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.539 | 203] 1.5 [DL + RSY] | 6586.204 | 79.383 | -11.2555 |
| Bottom | 1.565 | 203] 1.5 [DL + RSY] | 6649.9726 | -90.5593 | 1.5796 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5575.84 | 183.4192 | -87.2824 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5639.6087 | 402.7973 | -87.8384 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6586.204 | -11.2555 | 12.27 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6586.204 | 14.6896 | 12.29 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6649.9726 | -26.7311 | 12.48 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6649.9726 | 1.5796 | 12.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.605 | 203] 1.5 [DL + RSY] | 6889.8245 | 77.1702 | 3.6249 |
| Bottom | 1.639 | 203] 1.5 [DL + RSY] | 6955.6176 | -97.6686 | 1.1204 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5845.2565 | 211.9721 | 83.7417 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5911.0495 | 482.3428 | 84.2856 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6889.8245 | -21.4546 | 12.89 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6889.8245 | 3.6249 | 12.78 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6567.8076 | -446.312 | 14.92 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6955.6176 | 34.9103 | 13.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.022 | 203] 1.5 [DL + RSY] | 7181.0355 | 237.0163 | -48.5275 |
| Bottom | 2.129 | 202] 1.5 [DL + RSX] | 6868.7905 | -225.3581 | 783.7682 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6114.0807 | 266.2743 | 119.1468 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6199.1056 | 783.7682 | 119.5579 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7181.0355 | -17.716 | 13.41 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6783.7656 | 266.2743 | 14.21 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6868.7905 | -716.911 | 17.15 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7266.0604 | 51.4227 | 13.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P2 | 4745 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 0 | 5645 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.05 | 202] 1.5 [DL + RSX] | 7021.1957 | 207.4449 | -668.6937 |
| Bottom | 2.235 | 202] 1.5 [DL + RSX] | 7102.5766 | -209.6368 | 1192.1002 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6347.4193 | 593.7416 | 147.5575 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6428.8003 | 1192.1002 | 147.6348 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7424.072 | -21.981 | 13.88 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7021.1957 | 593.7416 | 16.67 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7102.5766 | -1189.4854 | 20.5 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7102.5766 | 1192.1002 | 20.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 202] 1.5 [DL + RSX] | 1271.1294 | 64.8082 | -202.2731 |
| Bottom | 0.724 | 202] 1.5 [DL + RSX] | 1313.6419 | -63.2495 | -39.7609 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1171.5858 | -127.0158 | 70.3041 | 128.9886 | 388.8147 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1214.0983 | 22.2865 | 70.2781 | 130.3031 | 390.1292 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1397.1427 | -146.2564 | 5.91 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1439.6552 | -53.8172 | 4.75 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1439.6552 | 36.3427 | 4.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.819 | 202] 1.5 [DL + RSX] | 1455.7263 | 68.1871 | 82.9338 |
| Bottom | 0.797 | 202] 1.5 [DL + RSX] | 1498.2388 | -66.3982 | -58.0026 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1324.0377 | 82.9338 | -43.8963 | 133.7025 | 393.5286 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1249.7106 | 26.5527 | -44.1635 | 131.4043 | 391.2303 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1572.5659 | -16.9906 | 4.6 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1572.5659 | 105.412 | 5.83 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1615.0783 | -69.591 | 5.45 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1615.0783 | 26.5527 | 4.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.866 | 202] 1.5 [DL + RSX] | 1649.0257 | 70.908 | 66.9616 |
| Bottom | 0.858 | 202] 1.5 [DL + RSX] | 1691.5381 | -69.0766 | -61.5787 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1370.5875 | 99.1958 | -42.3686 | 135.1419 | 394.9679 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1413.1 | 27.076 | -42.8564 | 136.4564 | 396.2825 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1751.821 | -32.5613 | 5.32 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1751.821 | 99.1958 | 6.24 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1794.3335 | -76.2226 | 6.04 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1794.3335 | 27.076 | 5.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.921 | 202] 1.5 [DL + RSX] | 1847.797 | 73.1789 | 65.5315 |
| Bottom | 0.916 | 202] 1.5 [DL + RSX] | 1890.3094 | -71.313 | -63.2169 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1534.8489 | 97.9301 | -41.8117 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1577.3614 | 27.79 | -42.3197 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1933.4175 | -35.0659 | 5.86 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1933.4175 | 97.9301 | 6.73 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1975.9299 | -78.9431 | 6.59 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1975.9299 | 27.79 | 5.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.979 | 202] 1.5 [DL + RSX] | 2050.9467 | 75.4907 | 65.6057 |
| Bottom | 0.98 | 202] 1.5 [DL + RSX] | 2093.4591 | -73.4418 | -64.5444 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1699.802 | 98.4188 | -42.1674 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1742.3144 | 28.2069 | -42.6832 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2116.6151 | -35.086 | 6.37 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2116.6151 | 98.4188 | 7.25 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2159.1275 | -81.0468 | 7.12 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2159.1275 | 28.2069 | 6.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.047 | 202] 1.5 [DL + RSX] | 2258.0752 | 77.701 | 65.8931 |
| Bottom | 1.048 | 202] 1.5 [DL + RSX] | 2300.5877 | -75.5358 | -65.5653 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1865.3993 | 98.3924 | -42.6606 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1907.9117 | 28.4961 | -43.1721 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2300.8581 | -34.0658 | 6.86 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2300.8581 | 98.3924 | 7.76 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2343.3706 | -83.1292 | 7.66 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2343.3706 | 28.4961 | 6.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.116 | 202] 1.5 [DL + RSX] | 2468.9799 | 79.6895 | 66.2843 |
| Bottom | 1.116 | 202] 1.5 [DL + RSX] | 2511.4923 | -77.5332 | -66.1596 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2031.5292 | 97.4874 | -43.1368 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2074.0417 | 29.0862 | -43.6208 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2485.6848 | -32.0183 | 7.35 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2485.6848 | 97.4874 | 8.26 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2528.1972 | -85.5454 | 8.21 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2528.1972 | 29.0862 | 7.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.183 | 202] 1.5 [DL + RSX] | 2683.4571 | 81.3672 | 66.6973 |
| Bottom | 1.185 | 202] 1.5 [DL + RSX] | 2725.9695 | -79.4042 | -66.3529 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2198.0366 | 95.8907 | -43.5612 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2240.549 | 30.2266 | -43.9951 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2670.6705 | -29.0316 | 7.82 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2683.4571 | 66.6973 | 8.38 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2725.9695 | -66.3529 | 8.49 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2725.9695 | 8.0052 | 7.68 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.249 | 202] 1.5 [DL + RSX] | 2901.2212 | 82.5479 | 67.1327 |
| Bottom | 1.251 | 202] 1.5 [DL + RSX] | 2943.7337 | -80.7713 | -65.5667 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2364.7256 | 93.8726 | -43.6288 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2407.238 | 32.4061 | -44.0013 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2855.414 | -25.3746 | 8.28 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2901.2212 | 67.1327 | 8.99 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2943.7337 | -65.5667 | 9.09 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2943.7337 | 6.5553 | 8.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.316 | 202] 1.5 [DL + RSX] | 3121.9541 | 83.5713 | 68.4712 |
| Bottom | 1.323 | 202] 1.5 [DL + RSX] | 3164.4665 | -83.1885 | -64.6276 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2531.4093 | 92.4457 | -43.9355 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2573.9218 | 33.6217 | -44.2503 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3039.6345 | -20.7035 | 8.73 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3121.9541 | 68.4712 | 9.62 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3164.4665 | -64.6276 | 9.69 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3164.4665 | 3.2022 | 8.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.101 | 202] 1.5 [DL + RSX] | 3344.7319 | 81.6205 | 70.4688 |
| Bottom | 1.116 | 202] 1.5 [DL + RSX] | 3387.2443 | -79.5431 | -101.8779 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2697.5006 | 90.5978 | -58.6706 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2740.0131 | 4.1711 | -58.9204 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3222.7377 | -16.6887 | 9.18 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3344.7319 | 70.4688 | 10.27 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3387.2443 | -38.1974 | 9.94 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3265.2502 | 4.1711 | 9.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P3 | 8575 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.159 | 202] 1.5 [DL + RSX] | 3568.1206 | 86.0536 | -38.6471 |
| Bottom | 1.287 | 202] 1.5 [DL + RSX] | 3610.633 | -97.2338 | 231.925 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2698.0028 | 34.1695 | 84.866 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2740.5152 | 231.925 | 84.8477 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3568.1206 | -38.6471 | 10.45 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3568.1206 | 34.1695 | 10.39 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3610.633 | 231.925 | 13.25 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.676 | 202] 1.5 [DL + RSX] | 3841.0178 | 185.3409 | -825.3833 |
| Bottom | 1.317 | 202] 1.5 [DL + RSX] | 3904.7864 | -173.8825 | -84.7924 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2843.5631 | -528.9173 | 252.7535 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2907.3318 | -4.4031 | 252.7296 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3841.0178 | -528.9173 | 10.38 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3904.7864 | -4.4031 | 7.26 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3688.6913 | 131.5514 | 7.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.266 | 202] 1.5 [DL + RSX] | 4140.5523 | 148.996 | 114.1803 |
| Bottom | 1.287 | 202] 1.5 [DL + RSX] | 4204.321 | -155.8533 | -60.7846 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3270.9318 | 170.9917 | -58.779 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3334.7005 | 177.7509 | -59.0066 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4140.5523 | -1.2173 | 7.68 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4140.5523 | 114.1803 | 8.37 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4204.321 | -60.7846 | 8.16 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4204.321 | 31.4628 | 7.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.335 | 202] 1.5 [DL + RSX] | 4433.8433 | 153.5755 | 121.0949 |
| Bottom | 1.341 | 202] 1.5 [DL + RSX] | 4497.612 | -155.322 | -79.1128 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3476.7834 | 210.1745 | -74.0784 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3540.552 | 166.2618 | -74.673 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4123.952 | -45.2803 | 7.92 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4433.8433 | 121.0949 | 8.96 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4497.612 | -79.1128 | 8.82 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4497.612 | 4.1171 | 8.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.359 | 202] 1.5 [DL + RSX] | 4723.4012 | 148.2246 | 92.3203 |
| Bottom | 1.377 | 202] 1.5 [DL + RSX] | 4787.1699 | -151.6157 | -76.1724 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3679.0608 | 186.7322 | -64.4157 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3742.8295 | 175.9383 | -65.2144 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4364.0593 | -76.2395 | 8.55 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4723.4012 | 92.3203 | 9.32 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4787.1699 | -76.1724 | 9.34 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4787.1699 | 0.1122 | 8.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.389 | 202] 1.5 [DL + RSX] | 5007.6685 | 143.0242 | 85.9318 |
| Bottom | 1.411 | 202] 1.5 [DL + RSX] | 5071.4372 | -147.3149 | -71.444 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3876.9897 | 184.3721 | -61.0285 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3940.7584 | 195.0154 | -61.9173 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4597.4614 | -85.0175 | 9.04 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5007.6685 | 85.9318 | 9.8 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5071.4372 | -71.444 | 9.83 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5071.4372 | 3.4455 | 9.41 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.416 | 202] 1.5 [DL + RSX] | 5285.7207 | 136.5917 | 84.5825 |
| Bottom | 1.442 | 202] 1.5 [DL + RSX] | 5349.4894 | -142.2711 | -71.8251 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4070.5787 | 193.6642 | -59.8871 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4134.3474 | 219.3211 | -60.7914 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4823.5889 | -96.386 | 9.53 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5285.7207 | 84.5825 | 10.31 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5349.4894 | -71.8251 | 10.35 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5349.4894 | 8.2693 | 9.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.448 | 202] 1.5 [DL + RSX] | 5556.2808 | 128.1952 | 84.4017 |
| Bottom | 1.477 | 202] 1.5 [DL + RSX] | 5620.0495 | -134.7196 | -84.8091 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4259.6456 | 212.4879 | -60.3462 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4323.4143 | 245.172 | -61.177 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5041.7707 | -120.9509 | 10.08 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5556.2808 | 84.4017 | 10.81 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5620.0495 | -84.8091 | 10.93 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5620.0495 | 11.7509 | 10.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.479 | 202] 1.5 [DL + RSX] | 5818.0927 | 120.1404 | 82.9805 |
| Bottom | 1.529 | 202] 1.5 [DL + RSX] | 5881.8613 | -133.2811 | -107.972 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4444.5651 | 237.8046 | -58.1602 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4508.3338 | 276.198 | -58.847 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5818.0927 | -11.852 | 10.85 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5818.0927 | 82.9805 | 11.29 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5881.8613 | -107.972 | 11.56 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5881.8613 | 22.0495 | 11.03 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.466 | 202] 1.5 [DL + RSX] | 6067.0269 | 94.7853 | 90.0291 |
| Bottom | 1.52 | 202] 1.5 [DL + RSX] | 6132.82 | 105.4593 | 166.5279 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4621.1961 | 272.6553 | 47.0117 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4686.9892 | 437.9965 | 47.5527 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6067.0269 | -41.2245 | 11.49 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6067.0269 | 90.0291 | 11.79 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6132.82 | -19.7634 | 11.48 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6132.82 | 166.5279 | 12.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.05 | 202] 1.5 [DL + RSX] | 6542.7235 | 271.2027 | -125.1394 |
| Bottom | 2.11 | 202] 1.5 [DL + RSX] | 6627.7484 | 273.7024 | 240.6173 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5048.7468 | 258.4406 | 64.3329 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5133.7717 | 543.7688 | 64.6742 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6542.7235 | -125.1394 | 12.89 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6542.7235 | 35.9856 | 12.34 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6627.7484 | -57.4926 | 12.63 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6627.7484 | 240.6173 | 13.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P3 | 8575 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 0 | 8575 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.972 | 202] 1.5 [DL + RSX] | 7042.8252 | -220.5164 | 157.6896 |
| Bottom | 2.031 | 202] 1.5 [DL + RSX] | 7124.2061 | 222.7083 | -307.7325 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5528.1677 | 423.1228 | -77.6103 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5609.5487 | 597.2317 | -77.6644 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7042.8252 | -138.7385 | 13.9 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7042.8252 | 157.6896 | 14.02 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7124.2061 | -307.7325 | 15.09 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7124.2061 | 184.6148 | 14.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.908 | 202] 1.5 [DL + RSX] | 1272.7849 | -67.6242 | -210.0161 |
| Bottom | 0.75 | 202] 1.5 [DL + RSX] | 1315.2974 | 66.9362 | -40.2669 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1168.8812 | -130.7177 | 73.163 | 128.905 | 388.731 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1211.3937 | 23.4908 | 73.1437 | 130.2195 | 390.0456 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1375.2544 | -149.6381 | 5.9 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1417.7669 | -52.6659 | 4.67 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1417.7669 | 35.8898 | 4.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.836 | 202] 1.5 [DL + RSX] | 1457.8561 | -71.5636 | 74.9921 |
| Bottom | 0.82 | 202] 1.5 [DL + RSX] | 1500.3685 | 70.0369 | -54.876 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1318.1041 | 74.9921 | -40.3549 | 133.519 | 393.3451 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1360.6166 | 18.854 | -40.3562 | 134.8336 | 394.6596 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1549.4573 | -22.8675 | 4.62 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1549.4573 | 96.5218 | 5.64 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1591.9697 | -64.9667 | 5.32 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1591.9697 | 28.9447 | 4.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.883 | 202] 1.5 [DL + RSX] | 1650.0575 | -74.0075 | 62.4594 |
| Bottom | 0.878 | 202] 1.5 [DL + RSX] | 1692.57 | 72.4649 | -58.466 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1387.881 | 93.8438 | -38.6469 | 135.6766 | 395.5027 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1430.3934 | 29.3488 | -39.1362 | 136.9911 | 396.8172 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1727.1837 | -35.985 | 5.3 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1727.1837 | 93.8438 | 6.1 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1769.6961 | -71.3917 | 5.91 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1769.6961 | 29.3488 | 5.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.937 | 202] 1.5 [DL + RSX] | 1846.8763 | -76.1898 | 61.0076 |
| Bottom | 0.934 | 202] 1.5 [DL + RSX] | 1889.3887 | 74.5499 | -60.063 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1549.6866 | 92.7162 | -38.0977 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1592.199 | 29.9575 | -38.6135 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1907.0447 | -38.5249 | 5.83 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1907.0447 | 92.7162 | 6.59 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1949.5571 | -73.8459 | 6.44 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1949.5571 | 29.9575 | 5.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.993 | 202] 1.5 [DL + RSX] | 2047.5543 | -78.3886 | 61.0886 |
| Bottom | 0.993 | 202] 1.5 [DL + RSX] | 2090.0667 | 76.5458 | -61.2913 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1711.7728 | 93.1259 | -38.4176 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1754.2852 | 30.2618 | -38.944 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2088.3713 | -38.3118 | 6.33 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2088.3713 | 93.1259 | 7.09 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2130.8837 | -75.6335 | 6.97 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2130.8837 | 30.2618 | 6.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.058 | 202] 1.5 [DL + RSX] | 2251.838 | -80.4875 | 61.4477 |
| Bottom | 1.06 | 202] 1.5 [DL + RSX] | 2294.3504 | 78.5212 | -62.2778 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1874.099 | 93.0228 | -38.921 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1916.6114 | 30.4472 | -39.4429 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2270.6388 | -37.0089 | 6.82 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2270.6388 | 93.0228 | 7.6 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2313.1512 | -77.5455 | 7.5 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2313.1512 | 30.4472 | 6.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.124 | 202] 1.5 [DL + RSX] | 2459.59 | -82.349 | 61.8544 |
| Bottom | 1.127 | 202] 1.5 [DL + RSX] | 2502.1024 | 80.3992 | -62.8998 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2036.557 | 92.0025 | -39.4129 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2079.0694 | 31.02 | -39.9044 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2459.59 | -4.6143 | 6.9 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2459.59 | 61.8544 | 7.69 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2502.1024 | -62.8998 | 7.82 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2502.1024 | 13.9215 | 7.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.19 | 202] 1.5 [DL + RSX] | 2670.6278 | -83.8783 | 62.2253 |
| Bottom | 1.194 | 202] 1.5 [DL + RSX] | 2713.1402 | 82.1423 | -63.1656 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2198.9944 | 90.3242 | -39.8524 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2241.5068 | 32.2474 | -40.2896 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2670.6278 | -3.6246 | 7.47 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2670.6278 | 62.2253 | 8.28 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2713.1402 | -63.1656 | 8.41 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2713.1402 | 12.1481 | 7.71 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.254 | 202] 1.5 [DL + RSX] | 2884.6584 | -84.8777 | 62.5767 |
| Bottom | 1.258 | 202] 1.5 [DL + RSX] | 2927.1708 | 83.3627 | -62.3973 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2361.2186 | 88.3183 | -39.9138 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2403.731 | 34.6215 | -40.2859 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2884.6584 | -2.4619 | 8.05 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2884.6584 | 62.5767 | 8.88 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2927.1708 | -62.3973 | 9 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2927.1708 | 10.6096 | 8.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.318 | 202] 1.5 [DL + RSX] | 3101.3321 | -85.6731 | 63.8959 |
| Bottom | 1.328 | 202] 1.5 [DL + RSX] | 3143.8445 | 85.6105 | -61.5104 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2523.041 | 87.0703 | -40.2544 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2565.5534 | 35.9538 | -40.5666 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3101.3321 | -0.6109 | 8.62 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3101.3321 | 63.8959 | 9.5 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3143.8445 | -61.5104 | 9.59 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3143.8445 | 7.0289 | 8.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.1 | 202] 1.5 [DL + RSX] | 3319.6692 | -83.4212 | 65.8719 |
| Bottom | 1.118 | 202] 1.5 [DL + RSX] | 3362.1816 | 81.7065 | -98.8559 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2683.8715 | 85.4119 | -54.8587 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2726.3839 | 6.3818 | -55.1055 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3319.6692 | -0.6556 | 9.23 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3319.6692 | 65.8719 | 10.14 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3362.1816 | -34.2018 | 9.81 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3222.5348 | 6.3818 | 9.04 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P4 | 18765 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.157 | 202] 1.5 [DL + RSX] | 3538.1949 | -87.5396 | -42.4759 |
| Bottom | 1.289 | 202] 1.5 [DL + RSX] | 3580.7074 | 99.397 | 230.6357 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2662.3054 | 29.6133 | 85.6151 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2704.8179 | 230.6357 | 85.5985 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3538.1949 | -42.4759 | 10.42 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3538.1949 | 29.6133 | 10.24 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3580.7074 | 230.6357 | 13.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.685 | 202] 1.5 [DL + RSX] | 3812.5169 | -187.7538 | -821.3573 |
| Bottom | 1.324 | 202] 1.5 [DL + RSX] | 3876.2856 | 176.4763 | -81.556 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2810.3012 | -524.1068 | 253.2412 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2874.0699 | 0.9536 | 253.2198 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3812.5169 | -524.1068 | 10.3 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3876.2856 | -81.556 | 7.68 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3876.2856 | 0.9536 | 7.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.269 | 202] 1.5 [DL + RSX] | 4113.037 | -151.0963 | 115.1357 |
| Bottom | 1.289 | 202] 1.5 [DL + RSX] | 4176.8056 | 158.1441 | -59.0935 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3251.4577 | 174.2741 | -57.8131 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3315.2264 | 181.9072 | -58.0546 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4113.037 | -0.0647 | 7.62 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4113.037 | 115.1357 | 8.33 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4176.8056 | -59.0935 | 8.1 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4176.8056 | 36.3432 | 7.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.337 | 202] 1.5 [DL + RSX] | 4407.2065 | -155.5915 | 120.9484 |
| Bottom | 1.344 | 202] 1.5 [DL + RSX] | 4470.9752 | 157.4838 | -78.9849 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3456.9511 | 212.3192 | -73.2634 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3520.7198 | 168.37 | -73.8769 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4087.9794 | -46.7279 | 7.86 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4407.2065 | 120.9484 | 8.91 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4470.9752 | -78.9849 | 8.77 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4470.9752 | 7.7695 | 8.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.361 | 202] 1.5 [DL + RSX] | 4697.5935 | -150.0901 | 90.7705 |
| Bottom | 1.38 | 202] 1.5 [DL + RSX] | 4761.3622 | 153.6521 | -76.4411 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3658.8307 | 187.1476 | -63.4545 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3722.5994 | 177.1399 | -64.2736 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4331.0687 | -78.2355 | 8.5 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4697.5935 | 90.7705 | 9.26 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4761.3622 | -76.4411 | 9.29 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4761.3622 | 3.2993 | 8.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.39 | 202] 1.5 [DL + RSX] | 4982.6307 | -144.7087 | 84.1698 |
| Bottom | 1.413 | 202] 1.5 [DL + RSX] | 5046.3994 | 149.2039 | -71.6531 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3856.2861 | 183.9887 | -60.1104 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3920.0548 | 195.9364 | -61.0149 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4567.2987 | -86.6139 | 8.99 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4982.6307 | 84.1698 | 9.75 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5046.3994 | -71.6531 | 9.79 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5046.3994 | 6.3492 | 9.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.415 | 202] 1.5 [DL + RSX] | 5261.3713 | -138.0577 | 83.0363 |
| Bottom | 1.443 | 202] 1.5 [DL + RSX] | 5325.14 | 143.9777 | -71.9556 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4049.2849 | 193.0772 | -59.1687 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4113.0535 | 220.089 | -60.0816 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4796.0952 | -97.5039 | 9.48 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5261.3713 | 83.0363 | 10.26 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5325.14 | -71.9556 | 10.31 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5325.14 | 10.4835 | 9.93 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.446 | 202] 1.5 [DL + RSX] | 5532.5137 | -129.4125 | 82.9104 |
| Bottom | 1.476 | 202] 1.5 [DL + RSX] | 5596.2824 | 136.214 | -85.1323 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4237.6124 | 211.9028 | -59.903 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4301.3811 | 245.44 | -60.736 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5016.7648 | -122.1368 | 10.04 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5532.5137 | 82.9104 | 10.76 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5596.2824 | -85.1323 | 10.89 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5596.2824 | 12.5089 | 10.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.476 | 202] 1.5 [DL + RSX] | 5794.7705 | -121.073 | 80.9413 |
| Bottom | 1.528 | 202] 1.5 [DL + RSX] | 5858.5391 | 134.5321 | -107.317 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4421.6233 | 236.9217 | -57.4447 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4485.392 | 276.8433 | -58.1295 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5794.7705 | -12.6823 | 10.81 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5794.7705 | 80.9413 | 11.23 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5858.5391 | -107.317 | 11.51 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5858.5391 | 22.1954 | 10.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.463 | 202] 1.5 [DL + RSX] | 6043.9881 | -95.4089 | 88.1473 |
| Bottom | 1.514 | 202] 1.5 [DL + RSX] | 6109.7812 | -104.6564 | 169.0388 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4597.1471 | 272.3433 | 48.4282 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4662.9402 | 442.4121 | 48.964 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6043.9881 | -41.3123 | 11.45 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6043.9881 | 88.1473 | 11.74 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6109.7812 | -15.6916 | 11.41 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6109.7812 | 169.0388 | 12.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.979 | 202] 1.5 [DL + RSX] | 6519.6539 | 251.6206 | -121.3127 |
| Bottom | 2.029 | 202] 1.5 [DL + RSX] | 6604.6788 | -254.1203 | 233.3845 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5023.7865 | 262.0956 | 62.6493 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5108.8114 | 540.6576 | 62.9829 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6519.6539 | -121.3127 | 12.82 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6519.6539 | 37.6566 | 12.31 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6604.6788 | -64.2936 | 12.63 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6604.6788 | 233.3845 | 13.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P4 | 18765 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 0 | 18765 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.015 | 202] 1.5 [DL + RSX] | 7024.1155 | 233.8146 | 164.745 |
| Bottom | 2.073 | 202] 1.5 [DL + RSX] | 7105.4964 | 236.0065 | -312.6474 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5507.333 | 435.2556 | -81.1574 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5588.7139 | 600.0499 | -81.2105 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7024.1155 | -130.6753 | 13.81 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7024.1155 | 164.745 | 14.02 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7105.4964 | -312.6474 | 15.09 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7105.4964 | 180.8341 | 14.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.239 | 203] 1.5 [DL + RSY] | 762.8161 | 138.0066 | -62.3534 |
| Bottom | 1.614 | 203] 1.5 [DL + RSY] | 805.3285 | -116.9797 | -36.8766 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 707.2762 | 51.0136 | 63.2918 | 111.1062 | 370.9323 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 749.7886 | 48.672 | 63.6975 | 112.3803 | 372.2064 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 911.3187 | -163.1117 | 4.8 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 911.3187 | 51.0136 | 3.24 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 953.8312 | -105.5335 | 4.12 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 953.8312 | 48.672 | 3.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.17 | 203] 1.5 [DL + RSY] | 1002.5967 | 103.2554 | 60.5812 |
| Bottom | 1.168 | 203] 1.5 [DL + RSY] | 1045.1092 | -105.8122 | -48.7033 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 978.1594 | 156.775 | -77.4658 | 119.2245 | 379.0506 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1020.6718 | 31.5895 | -77.9389 | 120.4986 | 380.3247 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1187.9716 | -46.7093 | 3.95 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1187.9716 | 156.775 | 5.48 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1230.484 | -114.7507 | 5.01 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1230.484 | 31.5895 | 3.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.164 | 203] 1.5 [DL + RSY] | 1239.6119 | 110.0035 | 52.0926 |
| Bottom | 1.14 | 203] 1.5 [DL + RSY] | 1510.3297 | -108.0989 | -49.6584 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1243.9017 | 158.181 | -78.6247 | 124.4828 | 384.3089 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1286.4142 | 34.6314 | -79.0689 | 125.7298 | 385.5559 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1463.5274 | -71.9153 | 5.06 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1463.5274 | 158.181 | 6.26 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1506.0399 | -122.614 | 5.89 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1506.0399 | 34.6314 | 4.66 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.169 | 203] 1.5 [DL + RSY] | 1770.8011 | 108.9855 | 49.0377 |
| Bottom | 1.164 | 203] 1.5 [DL + RSY] | 1813.3135 | -108.1362 | -48.059 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1506.6215 | 160.173 | -78.2674 | 131.9947 | 391.8208 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1549.134 | 39.1803 | -78.6986 | 131.9947 | 391.8208 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1739.1397 | -80.3294 | 5.95 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1770.8011 | 49.0377 | 5.6 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1813.3135 | -37.5762 | 5.56 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1781.6522 | 39.1803 | 5.49 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.198 | 203] 1.5 [DL + RSY] | 2072.8368 | 109.5846 | 48.3202 |
| Bottom | 1.2 | 203] 1.5 [DL + RSY] | 2115.3492 | -108.7893 | -46.4604 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1766.7965 | 165.0553 | -79.2792 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1809.3089 | 43.3687 | -79.6944 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2015.0341 | -85.5315 | 6.79 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2072.8368 | 48.3202 | 6.43 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2115.3492 | -36.9099 | 6.39 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2057.5465 | 43.3687 | 6.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.262 | 203] 1.5 [DL + RSY] | 2374.598 | 110.0763 | 47.278 |
| Bottom | 1.265 | 203] 1.5 [DL + RSY] | 2417.1104 | -109.5499 | -45.0267 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2025.1053 | 169.1213 | -80.5444 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2067.6178 | 47.8058 | -80.9425 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2291.6652 | -90.1994 | 7.62 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2374.598 | 47.278 | 7.25 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2417.1104 | -36.5209 | 7.22 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2334.1777 | 47.8058 | 7.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.286 | 203] 1.5 [DL + RSY] | 2676.6745 | 110.7277 | 45.8141 |
| Bottom | 1.293 | 203] 1.5 [DL + RSY] | 2719.1869 | -110.5043 | -44.0095 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2282.122 | 171.6342 | -81.8371 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2324.6344 | 52.8926 | -82.2171 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2569.5047 | -94.0885 | 8.44 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2676.6745 | 45.8141 | 8.07 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2719.1869 | -36.0344 | 8.05 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2612.0172 | 52.8926 | 7.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.366 | 203] 1.5 [DL + RSY] | 2979.6417 | 111.4165 | 44.0424 |
| Bottom | 1.378 | 203] 1.5 [DL + RSY] | 3022.1542 | -111.5368 | -43.072 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2538.3967 | 172.1393 | -82.9527 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2580.9092 | 59.2112 | -83.3124 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2849.0648 | -96.7616 | 9.26 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2979.6417 | 44.0424 | 8.89 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3022.1542 | -35.3077 | 8.89 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2891.5773 | 59.2112 | 8.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.395 | 203] 1.5 [DL + RSY] | 3284.0618 | 112.2158 | 42.6149 |
| Bottom | 1.409 | 203] 1.5 [DL + RSY] | 3326.5743 | -112.8566 | -42.3467 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2794.471 | 170.5743 | -83.9311 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2836.9835 | 67.3816 | -84.2693 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3130.9021 | -97.7977 | 10.06 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3284.0618 | 42.6149 | 9.71 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3326.5743 | -34.1717 | 9.72 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3173.4146 | 67.3816 | 9.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.475 | 203] 1.5 [DL + RSY] | 3590.4091 | 112.7149 | 42.3292 |
| Bottom | 1.49 | 203] 1.5 [DL + RSY] | 3632.9215 | -113.1917 | -46.1752 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3050.8058 | 166.5703 | -85.2579 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3093.3182 | 74.2229 | -85.5742 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3415.5451 | -96.7248 | 10.83 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3590.4091 | 42.3292 | 10.56 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3632.9215 | -33.8639 | 10.56 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3458.0575 | 74.2229 | 10.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.499 | 203] 1.5 [DL + RSY] | 3899.5315 | 114.9942 | 40.1773 |
| Bottom | 1.547 | 203] 1.5 [DL + RSY] | 3942.044 | -118.1472 | -85.2682 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3308.2255 | 157.1233 | -100.1488 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3350.7379 | 62.851 | -100.4493 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3703.958 | -97.3913 | 11.64 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3899.5315 | 40.1773 | 11.39 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3746.4705 | -212.347 | 13.36 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3746.4705 | 62.851 | 11.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P5 | 22295 | 0 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 22895 | 0 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.552 | 203] 1.5 [DL + RSY] | 4210.8701 | 110.3667 | -22.1977 |
| Bottom | 1.631 | 203] 1.5 [DL + RSY] | 4253.3826 | -104.1535 | 239.4911 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3566.169 | 95.1234 | 150.3258 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3608.6815 | 415.2335 | 150.529 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4210.8701 | -1.9436 | 11.72 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3995.6479 | 95.1234 | 12.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 2508.792 | -50.7795 | 7.67 | 5 |
| Botttom–Right | Leg 1 | 450 | 206] [0.9 DL + 1.5 RSX] | 4253.3826 | 239.4911 | 15.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.405 | 203] 1.5 [DL + RSY] | 4486.6931 | 98.9963 | -995.6357 |
| Bottom | 1.172 | 203] 1.5 [DL + RSY] | 4550.4618 | -98.49 | -87.4834 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3792.5738 | -745.7263 | 346.8781 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3856.3424 | 171.1414 | 346.9889 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4486.6931 | -754.8659 | 12.97 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4550.4618 | -38.0589 | 8.66 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4316.4003 | 171.1414 | 9.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.206 | 203] 1.5 [DL + RSY] | 4775.4301 | 96.1177 | -58.15 |
| Bottom | 1.222 | 203] 1.5 [DL + RSY] | 4839.1987 | -99.6426 | 30.2952 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4034.2061 | 96.3931 | 99.4716 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4097.9748 | 267.9242 | 99.6796 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4775.4301 | -20.6843 | 8.97 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4517.141 | 96.3931 | 8.96 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4580.9096 | -231.3999 | 9.91 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4839.1987 | 30.2952 | 9.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.257 | 203] 1.5 [DL + RSY] | 5068.1801 | 93.9758 | 51.0239 |
| Bottom | 1.272 | 203] 1.5 [DL + RSY] | 5131.9487 | -98.3949 | -13.2255 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4279.4269 | 181.1559 | -92.5129 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4343.1956 | 266.0441 | -92.6911 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4787.0813 | -107.1141 | 9.53 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5068.1801 | 51.0239 | 9.7 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5131.9487 | -13.2255 | 9.59 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5131.9487 | 11.744 | 9.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.307 | 203] 1.5 [DL + RSY] | 5362.5655 | 92.4669 | 32.7556 |
| Bottom | 1.329 | 203] 1.5 [DL + RSY] | 5426.3342 | -97.6651 | -18.5251 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4526.8671 | 168.3427 | -88.4183 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4590.6358 | 279.5834 | -88.6026 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5060.3714 | -133.9288 | 10.2 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5362.5655 | 32.7556 | 10.13 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5426.3342 | -18.5251 | 10.16 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5426.3342 | 3.1904 | 10.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.357 | 203] 1.5 [DL + RSY] | 5658.7192 | 90.3773 | 20.7775 |
| Bottom | 1.385 | 203] 1.5 [DL + RSY] | 5722.4878 | -96.8104 | -18.4084 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4777.2259 | 165.0385 | -85.3207 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4840.9945 | 301.3297 | -85.5772 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5658.7192 | -5.3559 | 10.51 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5658.7192 | 20.7775 | 10.61 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5722.4878 | -18.4084 | 10.71 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5722.4878 | 1.545 | 10.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 203] 1.5 [DL + RSY] | 5956.4848 | 87.7126 | -7.4474 |
| Bottom | 1.441 | 203] 1.5 [DL + RSY] | 6020.2535 | -95.6295 | -18.6822 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5031.0009 | 166.5024 | -84.0234 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5094.7695 | 325.2096 | -84.4037 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5956.4848 | -7.4474 | 11.08 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5956.4848 | 15.0922 | 11.12 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6020.2535 | -0.0318 | 11.15 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5681.3152 | 325.2096 | 12.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.471 | 203] 1.5 [DL + RSY] | 6255.7768 | 84.5342 | 9.886 |
| Bottom | 1.498 | 203] 1.5 [DL + RSY] | 6319.5454 | -94.5418 | -22.2244 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5288.8479 | 167.6025 | -83.8077 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5352.6166 | 352.3145 | -84.3098 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6255.7768 | -11.4193 | 11.66 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6255.7768 | 9.886 | 11.65 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6319.5454 | -3.6768 | 11.73 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5965.303 | 352.3145 | 13.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.533 | 203] 1.5 [DL + RSY] | 6555.7388 | 79.7247 | 3.4522 |
| Bottom | 1.558 | 203] 1.5 [DL + RSY] | 6619.5074 | -91.0351 | -4.093 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5550.9013 | 173.8163 | 86.829 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5614.67 | 419.5969 | 87.3863 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6555.7388 | -19.336 | 12.26 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6555.7388 | 3.4522 | 12.16 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6619.5074 | -4.093 | 12.28 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6619.5074 | 12.8857 | 12.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.599 | 203] 1.5 [DL + RSY] | 6859.4248 | 77.4432 | -8.3886 |
| Bottom | 1.634 | 203] 1.5 [DL + RSY] | 6925.2179 | -97.9454 | -46.374 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5820.5052 | 223.0228 | -83.3792 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5886.2983 | 441.146 | -83.9253 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6859.4248 | -8.3886 | 12.75 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6859.4248 | 12.6604 | 12.78 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6925.2179 | -0.3741 | 12.83 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6548.2569 | 441.146 | 14.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.015 | 203] 1.5 [DL + RSY] | 7150.3934 | 236.5395 | 47.7171 |
| Bottom | 2.125 | 202] 1.5 [DL + RSX] | 6848.9501 | -224.7372 | -787.6364 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6089.0317 | 328.1049 | -118.8248 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6174.0566 | 713.5221 | -119.2352 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6763.9253 | -271.1707 | 14.2 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7150.3934 | 47.7171 | 13.54 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7235.4183 | -10.0771 | 13.46 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6848.9501 | 713.5221 | 17.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P5 | 22595 | 0 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 0 | 23495 | 0 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.043 | 202] 1.5 [DL + RSX] | 6998.8492 | 206.605 | 666.2033 |
| Bottom | 2.232 | 202] 1.5 [DL + RSX] | 7080.2302 | -208.7969 | -1200.826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6319.6798 | 666.2033 | -149.166 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6401.0607 | 1180.9346 | -149.2433 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6998.8492 | -595.9202 | 16.64 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7391.2023 | 58.0919 | 14.05 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7080.2302 | -1200.826 | 20.52 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7080.2302 | 1180.9346 | 20.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.96 | 202] 1.5 [DL + RSX] | 1557.4989 | 66.7951 | -239.889 |
| Bottom | 0.776 | 202] 1.5 [DL + RSX] | 1600.0113 | -62.3283 | 38.0404 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1434.3395 | -183.9316 | 89.7055 | 137.1131 | 396.9392 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1476.852 | 52.8182 | 89.7158 | 138.4276 | 398.2537 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1605.3211 | -183.9316 | 7.01 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1647.8335 | -36.7959 | 5.09 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1647.8335 | 52.8182 | 5.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.877 | 202] 1.5 [DL + RSX] | 1771.4608 | 63.5108 | 112.9567 |
| Bottom | 0.845 | 202] 1.5 [DL + RSX] | 1813.9733 | -62.587 | -57.8178 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1593.5586 | 128.4054 | -54.4537 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1636.071 | 25.1456 | -54.692 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1139.643 | -22.8599 | 3.48 | 5 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1822.9434 | 128.4054 | 6.85 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1865.4559 | -79.0639 | 6.28 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1865.4559 | 25.1456 | 5.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.928 | 202] 1.5 [DL + RSX] | 1992.2472 | 66.5033 | 89.2134 |
| Bottom | 0.916 | 202] 1.5 [DL + RSX] | 2034.7596 | -64.5055 | -58.5965 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1754.7139 | 101.3262 | -45.2826 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1797.2263 | 26.0208 | -45.5929 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2042.3311 | -32.76 | 6.13 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2042.3311 | 101.3262 | 7.08 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2084.8436 | -85.6665 | 6.98 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2084.8436 | 26.0208 | 6.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.004 | 202] 1.5 [DL + RSX] | 2215.8989 | 68.9875 | 92.3707 |
| Bottom | 0.988 | 202] 1.5 [DL + RSX] | 2258.4113 | -66.7568 | -57.9072 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1917.2121 | 101.2785 | -44.5789 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1959.7246 | 28.7914 | -44.9567 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2263.0045 | -36.7076 | 6.8 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2263.0045 | 101.2785 | 7.69 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2305.517 | -87.2675 | 7.62 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2305.517 | 28.7914 | 6.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.081 | 202] 1.5 [DL + RSX] | 2441.347 | 71.2781 | 96.8341 |
| Bottom | 1.062 | 202] 1.5 [DL + RSX] | 2483.8595 | -68.9685 | -59.4091 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2080.8916 | 102.2318 | -44.6808 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2123.404 | 29.6095 | -45.1163 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2484.7438 | -35.4549 | 7.39 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2484.7438 | 102.2318 | 8.32 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2527.2562 | -88.1682 | 8.24 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2527.2562 | 29.6095 | 7.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.156 | 202] 1.5 [DL + RSX] | 2668.0533 | 73.4692 | 99.8351 |
| Bottom | 1.136 | 202] 1.5 [DL + RSX] | 2710.5658 | -71.1405 | -61.441 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2245.509 | 101.485 | -44.6647 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2288.0214 | 30.1179 | -45.121 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2707.2839 | -34.03 | 7.99 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2707.2839 | 101.485 | 8.93 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2749.7963 | -88.9894 | 8.87 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2749.7963 | 30.1179 | 8.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.15 | 202] 1.5 [DL + RSX] | 2895.6123 | 75.5069 | 101.6403 |
| Bottom | 1.131 | 202] 1.5 [DL + RSX] | 2938.1247 | -73.2436 | -63.4511 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2410.8264 | 99.6836 | -44.5955 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2453.3389 | 31.1344 | -45.0284 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2930.3576 | -32.1792 | 8.59 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2930.3576 | 99.6836 | 9.52 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2972.8701 | -90.4084 | 9.51 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2972.8701 | 31.1344 | 8.69 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.218 | 202] 1.5 [DL + RSX] | 3123.6555 | 77.3114 | 101.6999 |
| Bottom | 1.201 | 202] 1.5 [DL + RSX] | 3166.168 | -75.2498 | -66.4318 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2576.6354 | 97.1231 | -44.3696 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2619.1478 | 32.5618 | -44.7434 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3153.6708 | -30.1293 | 9.18 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3153.6708 | 97.1231 | 10.11 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3196.1832 | -92.6808 | 10.17 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3196.1832 | 32.5618 | 9.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.319 | 202] 1.5 [DL + RSX] | 3351.8038 | 78.7388 | 99.3453 |
| Bottom | 1.309 | 202] 1.5 [DL + RSX] | 3394.3163 | -76.9966 | -71.1951 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2767.8393 | 99.3453 | -44.3343 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2810.3518 | 11.5417 | -44.5082 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3376.8817 | -28.668 | 9.78 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3376.8817 | 94.1395 | 10.69 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3419.3941 | -94.6917 | 10.81 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3419.3941 | 35.0384 | 9.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.382 | 202] 1.5 [DL + RSX] | 3579.6534 | 79.7701 | 95.0499 |
| Bottom | 1.385 | 202] 1.5 [DL + RSX] | 3622.1659 | -78.688 | -77.8144 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2928.992 | 95.0499 | -44.9338 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2971.5045 | 21.7108 | -45.0859 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3599.5811 | -27.5406 | 10.38 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3599.5811 | 92.2402 | 11.28 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3642.0935 | -95.3208 | 11.44 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3642.0935 | 39.2172 | 10.66 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.211 | 202] 1.5 [DL + RSX] | 3806.8896 | 79.8933 | 89.354 |
| Bottom | 1.223 | 202] 1.5 [DL + RSX] | 3849.4021 | -77.5574 | -129.5771 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3090.1624 | 89.354 | -58.9204 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3132.6748 | -6.0875 | -59.0572 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3821.5018 | -26.601 | 10.98 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3821.5018 | 93.1661 | 11.91 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3864.0142 | -142.0542 | 12.71 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3864.0142 | 6.3896 | 10.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P6 | 27340 | 600 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1200 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.272 | 202] 1.5 [DL + RSX] | 4034.0985 | 83.8993 | -56.9103 |
| Bottom | 1.42 | 202] 1.5 [DL + RSX] | 4076.6109 | -97.9601 | 300.6053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3251.6411 | 37.8687 | 102.1387 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3294.1536 | 300.6053 | 102.2525 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4042.8738 | -69.4413 | 12.19 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4042.8738 | 50.3997 | 11.93 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4085.3862 | 291.2233 | 15.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.704 | 202] 1.5 [DL + RSX] | 4282.6886 | 175.5499 | -936.1058 |
| Bottom | 1.371 | 202] 1.5 [DL + RSX] | 4346.4573 | -166.3531 | -150.667 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3406.984 | -709.9643 | 307.1554 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3470.7526 | 124.1673 | 307.2979 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4286.413 | -704.2042 | 12.28 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4350.1817 | -222.5598 | 9.43 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4346.4573 | 124.1673 | 8.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 202] 1.5 [DL + RSX] | 4580.9108 | 165.3311 | 143.3433 |
| Bottom | 1.422 | 202] 1.5 [DL + RSX] | 4644.6795 | -166.9965 | -136.1651 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3560.3395 | 186.9238 | -80.2941 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3624.1082 | 206.4168 | -80.663 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4603.3297 | -50.0839 | 8.83 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4603.3297 | 186.9238 | 9.68 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4667.0983 | -224.4256 | 10.03 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4667.0983 | 206.4168 | 9.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.441 | 202] 1.5 [DL + RSX] | 4877.0653 | 159.3808 | 152.6584 |
| Bottom | 1.464 | 202] 1.5 [DL + RSX] | 4940.834 | -162.8996 | -152.8527 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3716.4325 | 198.9166 | -90.6441 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3780.2012 | 195.4581 | -91.2374 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4917.8161 | -56.6271 | 9.46 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4917.8161 | 198.9166 | 10.33 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4981.5848 | -258.4848 | 10.82 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4981.5848 | 195.4581 | 10.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.473 | 202] 1.5 [DL + RSX] | 5169.7514 | 155.7737 | 128.7174 |
| Bottom | 1.503 | 202] 1.5 [DL + RSX] | 5233.5201 | -159.3993 | -153.1337 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3871.9599 | 174.5135 | -82.6836 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3935.7286 | 211.0102 | -83.4445 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5228.0713 | -79.9306 | 10.18 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5228.0713 | 174.5135 | 10.76 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5291.84 | -270.8799 | 11.47 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5291.84 | 211.0102 | 11.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.506 | 202] 1.5 [DL + RSX] | 5458.833 | 151.2385 | 121.5543 |
| Bottom | 1.544 | 202] 1.5 [DL + RSX] | 5522.6017 | -155.6351 | -163.5773 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4028.1029 | 171.764 | -81.9137 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4091.8716 | 228.9564 | -82.7713 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5533.7728 | -77.5409 | 10.73 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5533.7728 | 171.764 | 11.31 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5597.5414 | -288.2749 | 12.15 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5597.5414 | 228.9564 | 11.78 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.533 | 202] 1.5 [DL + RSX] | 5743.8174 | 145.5762 | 108.7486 |
| Bottom | 1.584 | 202] 1.5 [DL + RSX] | 5807.5861 | -150.9931 | -185.4711 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4185.7584 | 172.9375 | -80.6249 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4249.5271 | 249.2011 | -81.5012 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5834.0988 | -81.7214 | 11.31 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5834.0988 | 172.9375 | 11.87 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5897.8675 | -311.8816 | 12.85 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5897.8675 | 249.2011 | 12.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.57 | 202] 1.5 [DL + RSX] | 6023.8715 | 138.8622 | 94.8428 |
| Bottom | 1.627 | 202] 1.5 [DL + RSX] | 6087.6402 | -146.1577 | -219.0267 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4345.8822 | 183.1614 | -78.8136 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4409.6509 | 275.6396 | -79.6298 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6127.8447 | -99.3386 | 11.96 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6127.8447 | 183.1614 | 12.48 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6191.6133 | -342.4733 | 13.58 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6191.6133 | 275.6396 | 13.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.6 | 202] 1.5 [DL + RSX] | 6297.7959 | 129.1872 | 99.1252 |
| Bottom | 1.655 | 202] 1.5 [DL + RSX] | 6361.5645 | -136.221 | -259.7099 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4625.1534 | 99.1252 | -75.4984 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4573.353 | 316.4676 | -76.1646 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6297.7959 | -24.1614 | 11.81 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6413.3649 | 208.565 | 13.16 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6477.1336 | -377.9888 | 14.33 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6477.1336 | 316.4676 | 13.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.646 | 202] 1.5 [DL + RSX] | 6565.2838 | 123.4869 | 137.9867 |
| Bottom | 1.76 | 202] 1.5 [DL + RSX] | 6631.0768 | -150.4774 | -301.0136 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4802.7736 | 137.9867 | -70.5354 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4868.5666 | 278.8523 | -70.6123 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6690.4384 | -180.0025 | 13.5 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6690.4384 | 255.2335 | 13.97 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6756.2315 | -402.7875 | 15 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6756.2315 | 380.6262 | 14.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.086 | 202] 1.5 [DL + RSX] | 6849.3854 | 260.075 | 213.1508 |
| Bottom | 2.188 | 202] 1.5 [DL + RSX] | 6934.4103 | 262.5748 | 479.8894 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5010.3097 | 213.1508 | -65.0724 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5095.3346 | 479.8894 | -65.1249 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6981.5182 | -241.9049 | 14.42 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6981.5182 | 322.5526 | 14.92 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7066.5431 | -469.0704 | 15.98 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7066.5431 | 523.3836 | 16.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P6 | 27340 | 900 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 0 | 27340 | 1800 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.033 | 202] 1.5 [DL + RSX] | 7076.5441 | 218.7037 | 399.7919 |
| Bottom | 2.127 | 202] 1.5 [DL + RSX] | 7157.9251 | 220.8956 | -711.7674 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5189.4096 | 399.7919 | -88.8682 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5270.7906 | 612.9528 | -88.877 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7212.4311 | -401.1234 | 15.83 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7212.4311 | 455.2044 | 16.17 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7293.8121 | -711.4335 | 17.9 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7293.8121 | 612.6189 | 17.29 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.8 | 202] 1.5 [DL + RSX] | 1137.5497 | -124.5186 | 273.802 |
| Bottom | 1.169 | 202] 1.5 [DL + RSX] | 1180.0621 | 109.7021 | -71.4629 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1056.5316 | 331.3018 | -136.1478 | 127.2647 | 387.0908 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1099.0441 | 54.1623 | -136.5367 | 128.4266 | 388.2527 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1402.0911 | 331.3018 | 8.5 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1444.6035 | -110.6358 | 5.55 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1444.6035 | 54.1623 | 4.77 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.062 | 202] 1.5 [DL + RSX] | 1583.6442 | -99.1308 | 68.0969 |
| Bottom | 1.067 | 202] 1.5 [DL + RSX] | 1626.1566 | 101.2392 | -51.9254 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1314.3269 | 99.3775 | -53.4685 | 134.3104 | 394.1364 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1356.8393 | 66.2531 | -53.9009 | 135.4722 | 395.2983 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1646.4467 | -81.767 | 5.71 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1646.4467 | 99.3775 | 5.95 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1688.9592 | -93.9938 | 6 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1688.9592 | 66.2531 | 5.61 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.166 | 202] 1.5 [DL + RSX] | 1847.7152 | -105.2202 | 95.785 |
| Bottom | 1.124 | 202] 1.5 [DL + RSX] | 1890.2276 | 103.5963 | -53.2946 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1567.9905 | 126.6803 | -63.3118 | 141.2431 | 401.0692 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1610.5029 | 69.3037 | -63.7483 | 142.405 | 402.231 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1889.5946 | -78.5679 | 6.34 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1889.5946 | 126.6803 | 7.01 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1932.107 | -102.5555 | 6.79 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1932.107 | 69.3037 | 6.33 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 202] 1.5 [DL + RSX] | 2113.9323 | -104.8055 | 101.6915 |
| Bottom | 1.182 | 202] 1.5 [DL + RSX] | 2156.4447 | 103.8904 | -55.8418 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1819.5755 | 127.9378 | -64.1144 | 147.584 | 407.4101 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1862.088 | 72.8135 | -64.5871 | 147.584 | 407.4101 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2133.2364 | -82.2783 | 7.07 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2133.2364 | 127.9378 | 7.7 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2175.7488 | -107.6353 | 7.54 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2175.7488 | 72.8135 | 7.06 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.245 | 202] 1.5 [DL + RSX] | 2381.5621 | -105.9155 | 107.3348 |
| Bottom | 1.212 | 202] 1.5 [DL + RSX] | 2424.0746 | 104.8291 | -60.5421 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2069.2492 | 129.6104 | -65.0411 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2111.7617 | 75.5138 | -65.5462 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2381.5621 | -61.1643 | 7.46 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2381.5621 | 107.3348 | 8.11 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2424.0746 | -60.5421 | 7.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2424.0746 | 24.7766 | 7.08 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.309 | 202] 1.5 [DL + RSX] | 2650.2469 | -106.8318 | 112.0191 |
| Bottom | 1.277 | 202] 1.5 [DL + RSX] | 2692.7593 | 105.8271 | -65.9185 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2317.1898 | 130.8333 | -65.9951 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2359.7023 | 77.9943 | -66.5126 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2650.2469 | -65.2422 | 8.27 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2650.2469 | 112.0191 | 8.92 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2692.7593 | -65.9185 | 8.4 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2692.7593 | 29.32 | 7.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.354 | 202] 1.5 [DL + RSX] | 2919.7968 | -107.8608 | 115.5249 |
| Bottom | 1.339 | 202] 1.5 [DL + RSX] | 2962.3093 | 106.977 | -71.4314 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2563.5701 | 131.203 | -66.8485 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2606.0825 | 80.8136 | -67.3505 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2919.7968 | -68.5187 | 9.06 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2919.7968 | 115.5249 | 9.72 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2962.3093 | -71.4314 | 9.22 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2962.3093 | 34.1844 | 8.7 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.43 | 202] 1.5 [DL + RSX] | 3190.1453 | -108.8716 | 117.3673 |
| Bottom | 1.419 | 202] 1.5 [DL + RSX] | 3232.6578 | 108.2077 | -77.9498 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2808.5776 | 130.6288 | -67.4802 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2851.09 | 83.7853 | -67.9402 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3190.1453 | -70.4437 | 9.84 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3190.1453 | 117.3673 | 10.49 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3232.6578 | -77.9498 | 10.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3232.6578 | 39.9596 | 9.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.465 | 202] 1.5 [DL + RSX] | 3461.289 | -109.8322 | 116.7212 |
| Bottom | 1.46 | 202] 1.5 [DL + RSX] | 3503.8014 | 109.5656 | -86.5012 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3052.4029 | 129.2277 | -67.7089 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3094.9153 | 86.6504 | -68.1083 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3461.289 | -70.5299 | 10.59 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3461.289 | 116.7212 | 11.24 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3503.8014 | -86.5012 | 10.93 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3503.8014 | 47.8379 | 10.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.536 | 202] 1.5 [DL + RSX] | 3733.2041 | -110.5052 | 112.874 |
| Bottom | 1.539 | 202] 1.5 [DL + RSX] | 3775.7166 | 110.3626 | -97.4814 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3295.1871 | 127.6352 | -67.8175 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3337.6996 | 90.8981 | -68.1477 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3733.2041 | -68.0268 | 11.31 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3733.2041 | 112.874 | 11.94 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3775.7166 | -97.4814 | 11.84 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3775.7166 | 59.2245 | 11.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.609 | 202] 1.5 [DL + RSX] | 4006.0942 | -111.8836 | 105.1804 |
| Bottom | 1.631 | 202] 1.5 [DL + RSX] | 4048.6066 | 113.4087 | 114.178 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3537.2981 | 126.1748 | 53.2786 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3579.8105 | 134.5444 | 53.5422 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4006.0942 | -60.711 | 11.97 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4006.0942 | 105.1804 | 12.59 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4048.6066 | -63.5829 | 12.13 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4048.6066 | 114.178 | 12.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P7 | 0 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 4335 | 0 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.69 | 202] 1.5 [DL + RSX] | 4281.6738 | -109.842 | 146.2085 |
| Bottom | 1.809 | 202] 1.5 [DL + RSX] | 4324.1862 | 111.2414 | -378.0515 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3780.479 | 180.5514 | -172.4265 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3822.9914 | -93.845 | -172.5968 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4281.6738 | -2.303 | 11.93 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4281.6738 | 146.2085 | 13.92 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4324.1862 | -378.0515 | 17.26 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2566.583 | 7.7844 | 7.24 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.492 | 202] 1.5 [DL + RSX] | 4517.615 | -107.3089 | 1126.7416 |
| Bottom | 1.238 | 202] 1.5 [DL + RSX] | 4581.3837 | 108.2333 | -235.5877 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3997.0635 | 1162.9729 | -454.0022 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4060.8322 | 215.8692 | -454.2007 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4517.615 | 1126.7416 | 15.32 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4581.3837 | -235.5877 | 9.94 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4581.3837 | 121.037 | 9.23 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.247 | 202] 1.5 [DL + RSX] | 4783.6019 | -106.803 | 136.8249 |
| Bottom | 1.286 | 202] 1.5 [DL + RSX] | 4847.3706 | 108.8087 | -234.3314 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4267.0279 | 184.7729 | -132.6835 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4330.7965 | 210.7815 | -133.1063 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4783.6019 | -69.0516 | 9.28 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4783.6019 | 136.8249 | 9.7 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4847.3706 | -234.3314 | 10.42 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4847.3706 | 99.9749 | 9.59 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.288 | 202] 1.5 [DL + RSX] | 5050.1483 | -102.3998 | 127.7763 |
| Bottom | 1.321 | 202] 1.5 [DL + RSX] | 5113.917 | 106.4977 | -195.8329 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4532.648 | 170.9697 | -117.9753 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4596.4167 | 251.2868 | -118.5358 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5050.1483 | -92.6371 | 9.92 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5050.1483 | 127.7763 | 10.14 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5113.917 | -195.8329 | 10.68 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5113.917 | 124.283 | 10.24 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.338 | 202] 1.5 [DL + RSX] | 5315.9812 | -99.1355 | 154.3301 |
| Bottom | 1.368 | 202] 1.5 [DL + RSX] | 5379.7499 | 104.0079 | -192.4784 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4792.8385 | 188.2687 | -124.2378 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4856.6072 | 271.7808 | -124.9137 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5315.9812 | -67.2382 | 10.26 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5315.9812 | 154.3301 | 10.8 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5379.7499 | -192.4784 | 11.15 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5379.7499 | 132.2888 | 10.78 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.382 | 202] 1.5 [DL + RSX] | 5580.8839 | -95.598 | 149.018 |
| Bottom | 1.418 | 202] 1.5 [DL + RSX] | 5644.6526 | 101.4308 | -203.4162 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5045.1942 | 175.2275 | -122.3321 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5108.9628 | 289.3104 | -123.0871 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5580.8839 | -57.3667 | 10.69 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5580.8839 | 149.018 | 11.25 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5644.6526 | -203.4162 | 11.71 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5644.6526 | 144.0087 | 11.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.422 | 202] 1.5 [DL + RSX] | 5844.1028 | -91.4394 | 130.4286 |
| Bottom | 1.467 | 202] 1.5 [DL + RSX] | 5907.8714 | 98.5897 | -223.7829 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5283.7113 | 157.9782 | -117.5404 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5347.48 | 308.6248 | -118.3173 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5844.1028 | -44.6507 | 11.1 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5844.1028 | 130.4286 | 11.63 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5907.8714 | -223.7829 | 12.32 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5907.8714 | 164.2617 | 11.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.457 | 202] 1.5 [DL + RSX] | 6104.8739 | -86.5271 | 103.0585 |
| Bottom | 1.516 | 202] 1.5 [DL + RSX] | 6168.6426 | 95.0372 | -254.6269 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5505.6711 | 150.6656 | -111.7712 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5569.4397 | 331.536 | -112.5038 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6104.8739 | -24.9728 | 11.46 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6104.8739 | 103.0585 | 11.94 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5679.7121 | -391.9566 | 12.94 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6168.6426 | 194.2063 | 12.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.492 | 202] 1.5 [DL + RSX] | 6362.5119 | -81.2861 | -8.2243 |
| Bottom | 1.568 | 202] 1.5 [DL + RSX] | 6426.2805 | 92.1821 | -297.4893 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5717.95 | 164.5287 | -105.5741 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5781.7187 | 365.25 | -106.1965 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6362.5119 | -8.2243 | 11.83 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6362.5119 | 76.7499 | 12.26 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6426.2805 | -297.4893 | 13.74 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5923.409 | 365.25 | 13.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.539 | 202] 1.5 [DL + RSX] | 6616.2404 | -73.3268 | -37.9699 |
| Bottom | 1.619 | 202] 1.5 [DL + RSX] | 6682.0334 | 89.0196 | -333.4162 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5926.4311 | 205.7539 | -88.2262 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5992.2242 | 422.3912 | -88.6967 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6616.2404 | -37.9699 | 12.49 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6616.2404 | 98.8983 | 12.86 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6682.0334 | -333.4162 | 14.43 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6682.0334 | 314.6532 | 14.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.024 | 202] 1.5 [DL + RSX] | 6865.1208 | -242.6558 | 191.166 |
| Bottom | 2.121 | 202] 1.5 [DL + RSX] | 6950.1457 | 245.1555 | -494.053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5615.5848 | 191.166 | -88.4612 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5700.6097 | 459.503 | -88.5139 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6865.1208 | -100.3966 | 13.33 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6865.1208 | 191.166 | 13.89 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6950.1457 | -494.053 | 15.92 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6950.1457 | 459.503 | 15.71 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P7 | 0 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 3735 | 0 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.043 | 202] 1.5 [DL + RSX] | 7160.4276 | -217.6143 | 397.5535 |
| Bottom | 2.133 | 202] 1.5 [DL + RSX] | 7241.8086 | 219.8062 | -689.7402 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5879.7135 | 397.5535 | -89.7888 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5961.0945 | 644.446 | -89.7978 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7160.4276 | -320.292 | 15.24 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7160.4276 | 397.5535 | 15.71 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7241.8086 | -689.7402 | 17.67 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7241.8086 | 644.446 | 17.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 10.142 | 202] 1.5 [DL + RSX] | 176.4312 | 318.9181 | 124.065 |
| Bottom | 5.612 | 202] 1.5 [DL + RSX] | 463.7012 | 207.6236 | -413.4281 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 390.5426 | 364.2468 | -109.4349 | 417.6847 | 1683.2543 |
| Bottom | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 620.3586 | 322.4375 | -109.5898 | 424.0828 | 1689.6524 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 246.1785 | -125.5797 | 0.21 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 446.3405 | 413.1936 | 0.5 | 5 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 676.1565 | -162.3277 | 0.48 | 5 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 676.1565 | 274.1879 | 0.55 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.436 | 202] 1.5 [DL + RSX] | 673.9158 | 241.1954 | 1024.3401 |
| Bottom | 13.706 | 202] 1.5 [DL + RSX] | 867.8395 | -474.0788 | 1243.7804 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 848.4036 | 1126.1368 | -81.0045 | 430.4316 | 1696.0011 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1059.0319 | 1215.7474 | -84.789 | 436.2954 | 1701.865 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1068.7281 | 1126.1368 | 1.27 | 5 |
| Bottom–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 741.0281 | -125.7771 | 0.5 | 5 |
| Botttom–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 1223.867 | 1227.06 | 1.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 12.97 | 202] 1.5 [DL + RSX] | 1930.0841 | 554.484 | 1691.5385 |
| Bottom | 5.45 | 206] [0.9 DL + 1.5 RSX] | 1122.1464 | -256.8717 | 1123.701 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 1956.2245 | 2219.3316 | -150.0917 | 461.2733 | 1726.8429 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 2126.0816 | 2098.3498 | -153.0415 | 466.0021 | 1731.5717 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1560.2704 | -440.6883 | 1.15 | 5 |
| Top–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 2474.0326 | 1691.5385 | 2.4 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2654.2277 | -306.3693 | 1.69 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2740.7035 | 1521.6526 | 2.45 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.115 | 206] [0.9 DL + 1.5 RSX] | 1278.7161 | 202.6757 | 1168.7311 |
| Bottom | 3.655 | 206] [0.9 DL + 1.5 RSX] | 1350.0851 | -230.0805 | 995.7898 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2378.0504 | 2657.4109 | -203.6563 | 473.0169 | 1738.5865 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2600.5791 | 2587.3885 | -209.2375 | 479.2121 | 1744.7817 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2940.2299 | -580.9152 | 2.02 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2975.9082 | 1584.0302 | 2.62 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3155.4126 | -895.408 | 2.32 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3254.7083 | 1334.1859 | 2.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.627 | 206] [0.9 DL + 1.5 RSX] | 1536.3214 | 247.9253 | 1040.349 |
| Bottom | 2.918 | 206] [0.9 DL + 1.5 RSX] | 1606.2991 | -238.5511 | 836.9394 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2850.8638 | 2879.381 | -232.9764 | 486.18 | 1751.7496 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3076.3499 | 2896.5121 | -237.1279 | 492.4576 | 1758.0272 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3493.8382 | -1197.6846 | 2.69 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3539.4402 | 1376.6882 | 2.82 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3712.848 | -1492.4323 | 2.99 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3825.0592 | 1117.7554 | 2.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.64 | 206] [0.9 DL + 1.5 RSX] | 1792.1436 | 247.9842 | 922.7223 |
| Bottom | 2.06 | 206] [0.9 DL + 1.5 RSX] | 1858.6187 | -240.8633 | 736.6928 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3326.5267 | 3161.9758 | -268.6939 | 499.4225 | 1764.9921 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3552.2732 | 3283.6281 | -271.3925 | 505.7073 | 1771.2769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4054.0226 | -1758.3201 | 3.34 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4112.2959 | 1203.4534 | 3.05 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4273.4477 | -2023.7246 | 3.62 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4401.958 | 988.6735 | 3.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.039 | 206] [0.9 DL + 1.5 RSX] | 2043.9376 | 252.1226 | 844.7045 |
| Bottom | 1.762 | 206] [0.9 DL + 1.5 RSX] | 2106.4543 | -246.3327 | 707.2406 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3801.6111 | 3507.0016 | -298.4624 | 512.6489 | 1778.2184 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4027.4631 | 3727.682 | -299.8362 | 518.9366 | 1784.5061 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4616.3468 | -2241.0639 | 3.94 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4690.4288 | 1097.8921 | 3.32 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4836.363 | -2531.4752 | 4.24 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4984.6066 | 946.4819 | 3.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.644 | 206] [0.9 DL + 1.5 RSX] | 2291.0938 | 252.5568 | 808.0407 |
| Bottom | 1.864 | 206] [0.9 DL + 1.5 RSX] | 2351.9373 | -271.5 | 720.4761 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4275.7318 | 3902.4225 | 334.3741 | 525.8484 | 1791.4179 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4501.626 | 4183.0147 | 335.0663 | 532.1373 | 1797.7068 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5180.4951 | -2695.8071 | 4.53 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5180.4951 | 3902.4225 | 5.24 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5401.0226 | -3007.3351 | 4.84 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5401.0226 | 4183.0147 | 5.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.878 | 206] [0.9 DL + 1.5 RSX] | 2583.6599 | 225.571 | 817.7064 |
| Bottom | 0.929 | 206] [0.9 DL + 1.5 RSX] | 2651.1635 | -241.903 | 596.5658 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4740.2865 | 4391.6251 | -326.9632 | 538.7816 | 1804.3511 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4965.405 | 4354.2974 | -326.8372 | 545.0489 | 1810.6184 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5774.3823 | -3055.4278 | 5.08 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5774.3823 | 4391.6251 | 5.86 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5994.8621 | -3588.2092 | 5.52 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5994.8621 | 4354.2974 | 5.97 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.897 | 206] [0.9 DL + 1.5 RSX] | 2902.1095 | 251.8654 | 709.9062 |
| Bottom | 0.797 | 202] 1.5 [DL + RSX] | 6660.8551 | -314.96 | 701.1071 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5204.3828 | 4586.426 | -274.0976 | 551.702 | 1817.2716 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5429.677 | 4636.4769 | -273.9 | 557.9742 | 1823.5438 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6384.9613 | -3594.6724 | 5.75 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6384.9613 | 4586.426 | 6.33 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6606.0447 | -3947.0439 | 6.08 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6606.0447 | 4636.4769 | 6.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.816 | 202] 1.5 [DL + RSX] | 6914.8609 | 314.7391 | 870.7876 |
| Bottom | 0.826 | 203] 1.5 [DL + RSY] | 7217.5146 | -181.577 | 4809.5501 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5667.1065 | 4861.7 | -274.8005 | 564.5842 | 1830.1538 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5892.6135 | 4809.5501 | -275.5602 | 570.8624 | 1836.4319 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6995.7217 | -3949.5164 | 6.3 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6995.7217 | 4861.7 | 6.84 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7217.5146 | -4185.5112 | 6.57 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7217.5146 | 4809.5501 | 6.93 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.838 | 202] 1.5 [DL + RSX] | 7463.2599 | 316.7005 | 840.7958 |
| Bottom | 0.854 | 203] 1.5 [DL + RSY] | 7830.1604 | -180.694 | 4862.3997 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6128.6858 | 5032.9992 | -292.3859 | 577.4346 | 1843.0042 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6354.4215 | 4862.3997 | -294.3788 | 583.7191 | 1849.2887 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7607.6296 | -4183.0568 | 6.79 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7607.6296 | 5032.9992 | 7.28 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7830.1604 | -4297.9398 | 6.98 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7830.1604 | 4862.3997 | 7.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.859 | 202] 1.5 [DL + RSX] | 8013.7494 | 317.4979 | 816.2219 |
| Bottom | 0.875 | 203] 1.5 [DL + RSY] | 8443.0944 | -177.959 | 4814.1067 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6588.5544 | 5080.4782 | -319.7954 | 590.2374 | 1855.8069 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6814.5177 | 4814.1067 | -322.6637 | 596.5282 | 1862.0977 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8219.8254 | -4289.7472 | 7.2 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8219.8254 | 5080.4782 | 7.66 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8443.0944 | -4301.8684 | 7.33 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8443.0944 | 4814.1067 | 7.63 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.879 | 202] 1.5 [DL + RSX] | 8565.5744 | 318.3004 | 794.0429 |
| Bottom | 0.893 | 202] 1.5 [DL + RSX] | 8865.9401 | -323.0665 | 595.2192 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7046.3532 | 5020.9593 | -351.4247 | 602.9825 | 1868.552 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7272.5444 | 4704.207 | -354.588 | 609.2796 | 1874.8492 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8831.7214 | -4283.4187 | 7.54 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8831.7214 | 5020.9593 | 7.98 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9055.7143 | -4231.9247 | 7.64 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9055.7143 | 4704.207 | 7.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.909 | 202] 1.5 [DL + RSX] | 9118.1535 | 318.4939 | 768.0769 |
| Bottom | 0.925 | 202] 1.5 [DL + RSX] | 9420.9514 | -324.371 | 565.0603 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7501.7567 | 4890.9169 | -382.6399 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7728.175 | 4586.1018 | -385.5652 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9442.6784 | -4195.6453 | 7.84 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9442.6784 | 4890.9169 | 8.25 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9667.3637 | -4139.4692 | 7.94 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9667.3637 | 4586.1018 | 8.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.938 | 202] 1.5 [DL + RSX] | 9670.9372 | 317.8386 | 732.7831 |
| Bottom | 0.955 | 202] 1.5 [DL + RSX] | 9976.2924 | -325.1773 | 528.2444 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7954.4904 | 4740.8851 | -410.2742 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8181.1359 | 4517.7893 | -412.5976 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10052.031 | -4074.7992 | 8.12 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10052.031 | 4740.8851 | 8.51 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10277.3609 | -4085.44 | 8.25 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10277.3609 | 4517.7893 | 8.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.965 | 202] 1.5 [DL + RSX] | 10223.3805 | 316.1821 | 687.0846 |
| Bottom | 0.985 | 202] 1.5 [DL + RSX] | 10531.3573 | -325.4378 | 497.6838 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8404.3386 | 4627.4535 | -433.1276 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8631.2112 | 4545.9735 | -434.6954 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10659.0682 | -3980.3109 | 8.41 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10659.0682 | 4627.4535 | 8.79 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10884.9791 | -4126.8415 | 8.62 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10884.9791 | 4545.9735 | 8.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.99 | 202] 1.5 [DL + RSX] | 10774.9421 | 313.184 | 637.1904 |
| Bottom | 1.016 | 202] 1.5 [DL + RSX] | 11085.5221 | -324.971 | 485.4545 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8851.1571 | 4599.2147 | -452.6479 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9078.2543 | 4684.0588 | -453.5305 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11263.0498 | -3970.9674 | 8.75 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11263.0498 | 4599.2147 | 9.12 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11489.4608 | -4303.6575 | 9.07 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11489.4608 | 4684.0588 | 9.29 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.014 | 202] 1.5 [DL + RSX] | 11324.8428 | 308.3556 | 589.2368 |
| Bottom | 1.046 | 203] 1.5 [DL + RSY] | 12089.9323 | -151.5375 | 4920.1149 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9294.7656 | 4675.0305 | -460.1012 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9522.0985 | 4920.1149 | -460.6168 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11863.1067 | -4092.6125 | 9.16 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11863.1067 | 4675.0305 | 9.5 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12089.9323 | -4592.2137 | 9.58 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12089.9323 | 4920.1149 | 9.78 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.052 | 203] 1.5 [DL + RSY] | 12458.0043 | 139.2005 | 4850.3698 |
| Bottom | 1.087 | 203] 1.5 [DL + RSY] | 12685.1253 | -147.351 | 5204.7832 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9734.8743 | 4850.3698 | -427.9955 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9962.4258 | 5204.7832 | -428.8297 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12458.0043 | -4329.1264 | 9.64 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12458.0043 | 4850.3698 | 9.94 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12685.1253 | -4835.2244 | 10.06 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12685.1253 | 5204.7832 | 10.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.098 | 203] 1.5 [DL + RSY] | 13049.1091 | 141.6108 | 5086.2931 |
| Bottom | 1.137 | 203] 1.5 [DL + RSY] | 13276.4612 | -156.6863 | 5357.082 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10172.8283 | 5086.2931 | -351.8185 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10400.5253 | 5357.082 | -353.5235 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13049.1091 | -4527.3335 | 10.09 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13049.1091 | 5086.2931 | 10.42 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13276.4612 | -4911.3806 | 10.45 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13276.4612 | 5357.082 | 10.71 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.108 | 203] 1.5 [DL + RSY] | 13635.7392 | 114.4515 | 5214.1293 |
| Bottom | 1.167 | 203] 1.5 [DL + RSY] | 13863.6115 | -145.8732 | 5567.0375 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10610.2335 | 5214.1293 | -369.5364 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10838.4078 | 5567.0375 | -371.7633 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13635.7392 | -4570.1263 | 10.45 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13635.7392 | 5214.1293 | 10.83 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13863.6115 | -5081.2476 | 10.88 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13863.6115 | 5567.0375 | 11.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.14 | 203] 1.5 [DL + RSY] | 14218.9063 | 116.13 | 5399.466 |
| Bottom | 1.191 | 203] 1.5 [DL + RSY] | 14447.3063 | -141.6154 | 5800.9799 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11048.791 | 5399.466 | -413.9862 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11277.3639 | 5800.9799 | -417.0787 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14218.9063 | -4709.8691 | 10.87 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14218.9063 | 5399.466 | 11.27 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14447.3063 | -5367.9724 | 11.38 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14447.3063 | 5800.9799 | 11.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.182 | 203] 1.5 [DL + RSY] | 14798.1142 | 115.4059 | 5609.8744 |
| Bottom | 1.234 | 203] 1.5 [DL + RSY] | 15027.0543 | -138.3808 | 6156.5784 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11489.1042 | 5609.8744 | -453.2843 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11718.0592 | 6156.5784 | -457.1462 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14798.1142 | -4965.2613 | 11.35 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14798.1142 | 5609.8744 | 11.72 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15027.0543 | -5740.9678 | 11.93 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15027.0543 | 6156.5784 | 12.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.225 | 203] 1.5 [DL + RSY] | 15372.3027 | 112.0687 | 5944.2288 |
| Bottom | 1.282 | 203] 1.5 [DL + RSY] | 15601.7783 | -133.8584 | 6719.8525 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11931.3135 | 5944.2288 | -503.9237 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12160.6319 | 6719.8525 | -508.1162 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15372.3027 | -5310.4598 | 11.88 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15372.3027 | 5944.2288 | 12.25 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15601.7783 | -6276.3504 | 12.57 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15601.7783 | 6719.8525 | 12.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.27 | 203] 1.5 [DL + RSY] | 15940.3792 | 107.062 | 6495.2135 |
| Bottom | 1.338 | 203] 1.5 [DL + RSY] | 16170.3875 | -127.7091 | 7577.1075 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12375.8228 | 6495.2135 | -561.4887 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12605.4978 | 7577.1075 | -565.53 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15940.3792 | -5827.5999 | 12.5 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 15940.3792 | 6495.2135 | 12.89 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16170.3875 | -7057.0532 | 13.35 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16170.3875 | 7577.1075 | 13.66 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.3 | 203] 1.5 [DL + RSY] | 16501.1147 | 100.5713 | 7355.9124 |
| Bottom | 1.378 | 203] 1.5 [DL + RSY] | 16731.6475 | -119.7705 | 8792.3681 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12823.2149 | 7355.9124 | 623.8723 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13053.2449 | 8792.3681 | 627.3269 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16501.1147 | -6606.0744 | 13.28 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16501.1147 | 7355.9124 | 13.72 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16731.6475 | -8135.2698 | 14.3 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16731.6475 | 8792.3681 | 14.69 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.362 | 203] 1.5 [DL + RSY] | 17053.0987 | 92.8199 | 8593.6471 |
| Bottom | 1.448 | 203] 1.5 [DL + RSY] | 17284.1406 | -105.5416 | 10384.2117 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13274.271 | 8593.6471 | 699.1341 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13504.668 | 10384.2117 | 701.7941 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17053.0987 | -7700.9966 | 14.23 | 5 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17053.0987 | 8593.6471 | 14.76 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17284.1406 | -9557.0816 | 15.45 | 5 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17284.1406 | 10384.2117 | 15.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.442 | 203] 1.5 [DL + RSY] | 17594.5046 | 87.0319 | 10225.9195 |
| Bottom | 1.528 | 203] 1.5 [DL + RSY] | 17832.5463 | -88.6186 | 12375.7038 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13729.8439 | 10225.9195 | -796.2689 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13967.0671 | 12375.7038 | -798.0727 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17594.5046 | -9158.2307 | 15.4 | 5 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17594.5046 | 10225.9195 | 16.02 | 5 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 17832.5463 | -11544.3626 | 16.93 | 5 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 17832.5463 | 12375.7038 | 17.41 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.158 | 203] 1.5 [DL + RSY] | 18243.3549 | 564.2074 | 11924.5049 |
| Bottom | 2.417 | 203] 1.5 [DL + RSY] | 18544.5974 | -573.064 | 15532.1179 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 14327.4949 | 11924.5049 | 928.1777 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 14627.9086 | 15532.1179 | 929.2345 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 18243.3549 | -11436.3694 | 17.1 | 5 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 18243.3549 | 11924.5049 | 17.38 | 5 |
| Bottom–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18544.5974 | -14862.586 | 19.28 | 5 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18544.5974 | 15532.1179 | 19.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P8 | 12304.9 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 5030 | 12305 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.379 | 203] 1.5 [DL + RSY] | 18955.5477 | 562.7165 | -15168.5433 |
| Bottom | 2.632 | 203] 1.5 [DL + RSY] | 19245.594 | 570.5286 | -18828.3249 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 15006.6639 | 14939.4363 | -929.1863 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 15296.2506 | 17992.0283 | -929.2657 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18955.5477 | -15168.5433 | 19.69 | 5 |
| Top–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18955.5477 | 14939.4363 | 19.56 | 5 |
| Bottom–Left | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 19245.594 | -18828.3249 | 22 | 5 |
| Botttom–Right | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 19245.594 | 17992.0283 | 21.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 9.639 | 202] 1.5 [DL + RSX] | 198.2599 | -304.9331 | 182.2358 |
| Bottom | 4.956 | 206] [0.9 DL + 1.5 RSX] | 277.6401 | -169.7358 | 351.9877 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 414.996 | 421.0728 | -96.5887 | 418.3655 | 1683.9351 |
| Bottom | Leg 1 | 750 | 204] 1.2 [DL + LL + RSX] | 644.812 | 431.3969 | -96.8177 | 424.7636 | 1690.3331 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 284.8369 | -101.1333 | 0.22 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 484.2576 | 495.175 | 0.57 | 5 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 714.0736 | -129.1282 | 0.48 | 5 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 714.0736 | 463.8874 | 0.68 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.664 | 206] [0.9 DL + 1.5 RSX] | 284.0118 | -126.6606 | 589.9484 |
| Bottom | 5.914 | 206] [0.9 DL + 1.5 RSX] | 400.366 | 204.0105 | 688.7594 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 803.3936 | 1062.4408 | -130.6387 | 429.1785 | 1694.748 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 958.5325 | 944.019 | -137.4332 | 433.4975 | 1699.0671 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 798.1931 | -95.9102 | 0.51 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 987.2151 | 913.2448 | 1.1 | 5 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1098.024 | -80.3848 | 0.67 | 5 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1142.354 | 842.9801 | 1.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.835 | 206] [0.9 DL + 1.5 RSX] | 574.0941 | 193.5587 | 528.9783 |
| Bottom | 4.831 | 206] [0.9 DL + 1.5 RSX] | 649.7489 | 198.3291 | 672.1515 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1341.1528 | 844.26 | 100.3346 | 444.1497 | 1709.7193 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1560.7083 | 1128.8998 | 100.2814 | 450.2621 | 1715.8317 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1760.4631 | -438.8873 | 1.26 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1760.4631 | 551.5011 | 1.33 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2034.7722 | -458.9938 | 1.43 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2034.7722 | 725.441 | 1.59 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.813 | 206] [0.9 DL + 1.5 RSX] | 818.2566 | -214.4701 | 722.3552 |
| Bottom | 4.608 | 206] [0.9 DL + 1.5 RSX] | 900.9461 | 218.372 | 663.3242 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1783.0065 | 1566.5704 | 148.6447 | 456.4509 | 1722.0205 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2019.1343 | 1801.2303 | 151.4379 | 463.0247 | 1728.5943 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2295.7007 | -271.6006 | 1.47 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2295.7007 | 835.0438 | 1.8 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2596.8466 | -278.8372 | 1.64 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2596.8466 | 759.446 | 1.93 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.084 | 206] [0.9 DL + 1.5 RSX] | 1095.9388 | -222.1997 | 714.1009 |
| Bottom | 3.613 | 206] [0.9 DL + 1.5 RSX] | 1177.1861 | 218.4754 | 632.0843 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2286.638 | 2166.2844 | 216.137 | 470.472 | 1736.0416 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2526.3906 | 2451.9084 | 219.3666 | 477.1467 | 1742.7163 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2900.6579 | -198.8656 | 1.77 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2900.6579 | 842.9097 | 2.15 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3208.3364 | -72.2407 | 1.87 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3208.3364 | 772.0451 | 2.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.369 | 206] [0.9 DL + 1.5 RSX] | 1369.4863 | -229.4293 | 726.8261 |
| Bottom | 2.801 | 206] [0.9 DL + 1.5 RSX] | 1446.8327 | 223.1529 | 609.7444 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2791.8142 | 2784.4239 | 268.7798 | 484.5361 | 1750.1057 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3031.3054 | 3040.819 | 271.1623 | 491.2035 | 1756.7731 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3511.3612 | -42.8267 | 2.03 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 3511.3612 | 897.826 | 2.53 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3555.2355 | -2179.3475 | 3.3 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3822.4 | 782.0386 | 2.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.524 | 206] [0.9 DL + 1.5 RSX] | 1636.96 | -232.4108 | 726.8467 |
| Bottom | 2.07 | 206] [0.9 DL + 1.5 RSX] | 1709.9396 | 228.7064 | 626.7102 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3294.6252 | 3327.2697 | 305.968 | 498.5344 | 1764.1039 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3534.0119 | 3591.6413 | 307.1647 | 505.1989 | 1770.7685 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3906.8412 | -2318.6087 | 3.59 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4124.2132 | 928.5789 | 2.9 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4152.2394 | -2630.6513 | 3.91 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4439.0614 | 818.9082 | 3.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.848 | 206] [0.9 DL + 1.5 RSX] | 1897.9599 | -232.9558 | 736.6587 |
| Bottom | 2.14 | 206] [0.9 DL + 1.5 RSX] | 1968.9872 | 256.0946 | 654.5381 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3795.3722 | 3827.0827 | 327.3845 | 512.4752 | 1778.0447 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4034.727 | 4086.8812 | 327.7862 | 519.1388 | 1784.7084 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4502.1773 | -2723.4078 | 4.16 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4740.0797 | 957.3937 | 3.26 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4747.0539 | -3091.8364 | 4.52 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 4747.0539 | 4086.8812 | 5.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.893 | 206] [0.9 DL + 1.5 RSX] | 2202.6976 | -203.4246 | 770.4024 |
| Bottom | 0.971 | 206] [0.9 DL + 1.5 RSX] | 2280.9067 | 222.7411 | 548.1611 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4278.7382 | 4352.1449 | -319.6062 | 525.9321 | 1791.5016 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4518.9043 | 4299.4145 | -319.4486 | 532.6183 | 1798.1879 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5125.4438 | -3085.6477 | 4.73 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5125.4438 | 4352.1449 | 5.47 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5370.3325 | -3649.889 | 5.2 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5370.3325 | 4299.4145 | 5.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.933 | 206] [0.9 DL + 1.5 RSX] | 2531.0291 | -231.524 | 682.9068 |
| Bottom | 0.794 | 206] [0.9 DL + 1.5 RSX] | 2606.7518 | 229.1849 | 516.2279 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4756.4108 | 4582.0072 | -272.6696 | 539.2305 | 1804.8 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4996.4167 | 4587.624 | -272.4329 | 545.9122 | 1811.4818 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5762.2079 | -3607.3139 | 5.4 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5762.2079 | 4582.0072 | 5.97 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6006.4775 | -4011.3399 | 5.77 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6006.4775 | 4587.624 | 6.11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.749 | 202] 1.5 [DL + RSX] | 6449.2638 | -285.4801 | 838.2009 |
| Bottom | 0.773 | 203] 1.5 [DL + RSY] | 6639.3186 | 164.3135 | 4770.4811 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5231.8394 | 4858.037 | -270.0211 | 552.4664 | 1818.036 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5471.6415 | 4770.4811 | -270.8054 | 559.1425 | 1824.7121 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6395.7676 | -3965.8197 | 5.97 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6395.7676 | 4858.037 | 6.49 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6639.3186 | -4240.6037 | 6.27 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6639.3186 | 4770.4811 | 6.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.773 | 203] 1.5 [DL + RSY] | 7027.2192 | -144.5105 | 5034.0745 |
| Bottom | 0.803 | 203] 1.5 [DL + RSY] | 7270.0264 | 163.7641 | 4829.3763 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5704.9624 | 5034.0745 | -287.5092 | 565.6382 | 1831.2077 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5944.5419 | 4829.3763 | -289.5768 | 572.308 | 1837.8776 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7027.2192 | -4191.7751 | 6.46 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7027.2192 | 5034.0745 | 6.95 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7270.0264 | -4341.3814 | 6.69 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7270.0264 | 4829.3763 | 6.97 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.801 | 203] 1.5 [DL + RSY] | 7655.9362 | -142.3257 | 5083.3528 |
| Bottom | 0.825 | 203] 1.5 [DL + RSY] | 7898.0025 | 161.5454 | 4783.1688 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6175.4064 | 5083.3528 | -316.1055 | 578.7353 | 1844.3049 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6414.761 | 4783.1688 | -319.0536 | 585.3989 | 1850.9685 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7655.9362 | -4288.2677 | 6.88 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7655.9362 | 5083.3528 | 7.34 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7898.0025 | -4335.2621 | 7.04 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7898.0025 | 4783.1688 | 7.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.822 | 202] 1.5 [DL + RSX] | 8147.7842 | -290.174 | 785.9924 |
| Bottom | 0.843 | 203] 1.5 [DL + RSY] | 8522.8863 | 158.4346 | 4673.8033 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6642.9421 | 5022.444 | -348.9379 | 591.7515 | 1857.3211 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6882.0687 | 4673.8033 | -352.1506 | 598.4088 | 1863.9784 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8281.5439 | -4273.3818 | 7.22 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8281.5439 | 5022.444 | 7.66 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8522.8863 | -4259.5243 | 7.35 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8522.8863 | 4673.8033 | 7.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.854 | 202] 1.5 [DL + RSX] | 8713.0154 | -290.7598 | 761.3606 |
| Bottom | 0.872 | 202] 1.5 [DL + RSX] | 9032.2963 | 298.2837 | 537.5038 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7107.3608 | 4890.2851 | -380.7463 | 604.6809 | 1870.2505 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7346.2584 | 4557.3265 | -383.6784 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8903.5856 | -4181.534 | 7.53 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8903.5856 | 4890.2851 | 7.94 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9144.2375 | -4167.4352 | 7.65 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9144.2375 | 4557.3265 | 7.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.884 | 202] 1.5 [DL + RSX] | 9277.0947 | -290.4992 | 723.0546 |
| Bottom | 0.903 | 202] 1.5 [DL + RSX] | 9598.2907 | 299.5478 | 497.586 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7568.4856 | 4740.2236 | -408.2335 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7807.1536 | 4492.8448 | -410.5257 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9521.5618 | -4063.3029 | 7.81 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9521.5618 | 4740.2236 | 8.21 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9761.5715 | -4120.5005 | 7.98 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9761.5715 | 4492.8448 | 8.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.912 | 202] 1.5 [DL + RSX] | 9839.6226 | -289.2367 | 670.4323 |
| Bottom | 0.934 | 202] 1.5 [DL + RSX] | 10162.8521 | 300.3323 | 462.0259 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8026.1773 | 4630.234 | -430.3771 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8264.6164 | 4525.2484 | -431.891 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10134.9173 | -3979.0744 | 8.11 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10134.9173 | 4630.234 | 8.49 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10374.3479 | -4174.0045 | 8.36 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10374.3479 | 4525.2484 | 8.57 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.938 | 202] 1.5 [DL + RSX] | 10400.1855 | -286.596 | 611.1911 |
| Bottom | 0.966 | 203] 1.5 [DL + RSY] | 10981.9903 | 145.792 | 4664.4074 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8480.3469 | 4607.3079 | -448.5444 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8718.5608 | 4664.4074 | -449.3699 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10743.0593 | -3986.2137 | 8.46 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10743.0593 | 4607.3079 | 8.82 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10981.9903 | -4362.8771 | 8.82 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10981.9903 | 4664.4074 | 8.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.962 | 202] 1.5 [DL + RSX] | 10958.1324 | -282.2175 | 557.4491 |
| Bottom | 1.002 | 203] 1.5 [DL + RSY] | 11583.8031 | 138.413 | 4895.7833 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8930.8577 | 4686.5468 | -453.6716 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9168.8366 | 4895.7833 | -454.1449 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11345.2874 | -4125.3977 | 8.89 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11345.2874 | 4686.5468 | 9.21 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11583.8031 | -4656.6025 | 9.33 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11583.8031 | 4895.7833 | 9.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.007 | 203] 1.5 [DL + RSY] | 11940.5664 | -124.7299 | 4860.1774 |
| Bottom | 1.041 | 203] 1.5 [DL + RSY] | 12178.7848 | 132.8671 | 5182.9187 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9377.4644 | 4860.1774 | -415.9474 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9615.2266 | 5182.9187 | -416.7337 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11940.5664 | -4372.9792 | 9.37 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11940.5664 | 4860.1774 | 9.65 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12178.7848 | -4887.7216 | 9.81 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12178.7848 | 5182.9187 | 9.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 203] 1.5 [DL + RSY] | 12531.5935 | -127.7612 | 5098.7384 |
| Bottom | 1.091 | 203] 1.5 [DL + RSY] | 12769.5785 | 141.2534 | 5366.7524 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9821.2682 | 5098.7384 | 346.3334 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10058.8872 | 5366.7524 | 348.0601 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12531.5935 | -4567.2864 | 9.82 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12531.5935 | 5098.7384 | 10.13 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12769.5785 | -4936.869 | 10.17 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12769.5785 | 5366.7524 | 10.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.067 | 203] 1.5 [DL + RSY] | 13116.7061 | -102.7398 | 5257.1679 |
| Bottom | 1.124 | 203] 1.5 [DL + RSY] | 13354.1697 | 132.8013 | 5572.2026 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10263.787 | 5257.1679 | -359.2724 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10500.93 | 5572.2026 | -361.5562 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13116.7061 | -4587.8172 | 10.17 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13116.7061 | 5257.1679 | 10.56 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13354.1697 | -5094.3912 | 10.6 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13354.1697 | 5572.2026 | 10.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.097 | 203] 1.5 [DL + RSY] | 13696.1747 | -103.217 | 5437.7266 |
| Bottom | 1.148 | 203] 1.5 [DL + RSY] | 13933.11 | 129.9129 | 5795.4574 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10706.0494 | 5437.7266 | -405.3251 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10942.7943 | 5795.4574 | -408.4907 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13696.1747 | -4720.4941 | 10.57 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13696.1747 | 5437.7266 | 10.99 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13933.11 | -5372.6779 | 11.09 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13933.11 | 5795.4574 | 11.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.138 | 203] 1.5 [DL + RSY] | 14269.5476 | -101.8963 | 5637.205 |
| Bottom | 1.192 | 203] 1.5 [DL + RSY] | 14505.9428 | 127.7305 | 6142.1132 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11148.6417 | 5637.205 | -445.5955 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11385.0044 | 6142.1132 | -449.5222 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14269.5476 | -4972.7357 | 11.05 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14269.5476 | 5637.205 | 11.44 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14505.9428 | -5740.7966 | 11.63 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14505.9428 | 6142.1132 | 11.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.179 | 203] 1.5 [DL + RSY] | 14835.8611 | -98.4344 | 5962.2005 |
| Bottom | 1.24 | 203] 1.5 [DL + RSY] | 15071.7213 | 124.1016 | 6702.1108 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11591.6615 | 5962.2005 | -496.2145 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 11827.6605 | 6702.1108 | -500.4558 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14835.8611 | -5318.2661 | 11.57 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14835.8611 | 5962.2005 | 11.95 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15071.7213 | -6272.7652 | 12.27 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15071.7213 | 6702.1108 | 12.52 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.224 | 203] 1.5 [DL + RSY] | 15394.1444 | -93.6343 | 6509.0178 |
| Bottom | 1.297 | 203] 1.5 [DL + RSY] | 15629.4726 | 118.8369 | 7562.1824 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12035.4388 | 6509.0178 | -553.7762 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12271.0803 | 7562.1824 | -557.8513 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15394.1444 | -5836.7929 | 12.2 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15394.1444 | 6509.0178 | 12.59 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 15629.4726 | -7052.1105 | 13.04 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 15629.4726 | 7562.1824 | 13.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.255 | 203] 1.5 [DL + RSY] | 15943.3024 | -87.5014 | 7370.6888 |
| Bottom | 1.338 | 203] 1.5 [DL + RSY] | 16178.1067 | 111.5841 | 8785.9634 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12480.4368 | 7370.6888 | 621.5975 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12715.7227 | 8785.9634 | 625.1699 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 15943.3024 | -6617.7923 | 12.97 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 15943.3024 | 7370.6888 | 13.41 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16178.1067 | -8132.5196 | 13.99 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16178.1067 | 8785.9634 | 14.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.317 | 203] 1.5 [DL + RSY] | 16482.0781 | -80.4535 | 8613.6528 |
| Bottom | 1.409 | 203] 1.5 [DL + RSY] | 16716.3737 | 98.8855 | 10392.659 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 12927.2849 | 8613.6528 | 699.1589 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13162.2037 | 10392.659 | 701.9302 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16482.0781 | -7717.5587 | 13.92 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16482.0781 | 8613.6528 | 14.44 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 16716.3737 | -9560.5956 | 15.13 | 5 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 16716.3737 | 10392.659 | 15.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.396 | 203] 1.5 [DL + RSY] | 17008.7673 | -74.2218 | 10256.4864 |
| Bottom | 1.482 | 203] 1.5 [DL + RSY] | 17249.2107 | 75.8862 | 12405.0483 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13376.5008 | 10256.4864 | -789.3378 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13617.7403 | 12405.0483 | -791.2409 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17008.7673 | -9181.9616 | 15.08 | 5 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17008.7673 | 10256.4864 | 15.7 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17249.2107 | -11550.5077 | 16.6 | 5 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17249.2107 | 12405.0483 | 17.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.136 | 203] 1.5 [DL + RSY] | 17645.7617 | -556.0908 | 11951.6172 |
| Bottom | 2.396 | 203] 1.5 [DL + RSY] | 17947.9076 | 564.9739 | 15592.9448 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 13971.2784 | 11951.6172 | 937.3569 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 14274.2242 | 15592.9448 | 938.6177 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 17645.7617 | -11473.6418 | 16.78 | 5 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 17645.7617 | 11951.6172 | 17.06 | 5 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 17947.9076 | -14862.7799 | 18.94 | 5 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 17947.9076 | 15592.9448 | 19.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P9 | 15035 | 7952.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 5030 | 15035 | 10875 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.175 | 203] 1.5 [DL + RSY] | 18388.2054 | -459.7768 | -15259.0401 |
| Bottom | 2.424 | 203] 1.5 [DL + RSY] | 18677.8756 | 467.5788 | -18890.8726 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 14681.962 | 14906.8854 | -922.1605 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 14972.0761 | 17998.7487 | -922.4814 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18388.2054 | -15259.0401 | 19.42 | 5 |
| Top–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18388.2054 | 14906.8854 | 19.21 | 5 |
| Bottom–Left | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 18677.8756 | -18890.8726 | 21.71 | 5 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 18677.8756 | 17998.7487 | 21.19 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.691 | 202] 1.5 [DL + RSX] | 1166.9716 | 119.047 | 283.1886 |
| Bottom | 1.107 | 202] 1.5 [DL + RSX] | 1397.0926 | -105.1542 | -77.8267 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1081.788 | 342.31 | -141.3038 | 127.955 | 387.7811 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1124.3005 | 47.8852 | -141.6918 | 129.1169 | 388.943 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1439.7637 | 342.31 | 8.75 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1482.2762 | -116.4614 | 5.73 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1482.2762 | 47.8852 | 4.78 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.036 | 202] 1.5 [DL + RSX] | 1611.1265 | 96.3581 | 63.4369 |
| Bottom | 1.044 | 202] 1.5 [DL + RSX] | 1653.6389 | -97.8982 | -54.6031 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1334.1068 | 96.7414 | -53.0256 | 134.8509 | 394.677 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1376.6192 | 63.7759 | -53.4647 | 136.0128 | 395.8389 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1678.8963 | -88.2738 | 5.89 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1678.8963 | 96.7414 | 6.01 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1721.4088 | -96.2606 | 6.12 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1721.4088 | 63.7759 | 5.67 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.14 | 202] 1.5 [DL + RSX] | 1869.776 | 102.1383 | 93.7414 |
| Bottom | 1.108 | 202] 1.5 [DL + RSX] | 1912.2884 | -100.365 | -54.9156 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1582.7238 | 127.2393 | -63.5408 | 141.6457 | 401.4718 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1625.2363 | 67.9777 | -63.9929 | 142.8076 | 402.6337 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1917.3722 | -82.9697 | 6.48 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1917.3722 | 127.2393 | 7.09 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1959.8847 | -103.7473 | 6.89 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1959.8847 | 67.9777 | 6.39 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.198 | 202] 1.5 [DL + RSX] | 2131.0322 | 102.016 | 100.3393 |
| Bottom | 1.167 | 202] 1.5 [DL + RSX] | 2173.5447 | -100.917 | -56.9019 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1829.5563 | 129.4465 | -64.5725 | 147.584 | 407.4101 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1872.0688 | 71.9932 | -65.0662 | 147.584 | 407.4101 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2156.7103 | -86.1661 | 7.19 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2156.7103 | 129.4465 | 7.79 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2199.2228 | -108.315 | 7.61 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2199.2228 | 71.9932 | 7.11 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.23 | 202] 1.5 [DL + RSX] | 2394.1413 | 103.2986 | 106.3219 |
| Bottom | 1.197 | 202] 1.5 [DL + RSX] | 2436.6537 | -102.0515 | -61.2824 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2074.7571 | 131.4589 | -65.7249 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2117.2695 | 75.1222 | -66.2495 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2397.1174 | -86.9549 | 7.87 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2397.1174 | 131.4589 | 8.48 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2439.6299 | -111.9045 | 8.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2439.6299 | 75.1222 | 7.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.295 | 202] 1.5 [DL + RSX] | 2658.6926 | 104.4064 | 111.1914 |
| Bottom | 1.267 | 202] 1.5 [DL + RSX] | 2701.205 | -103.2371 | -66.5063 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2318.4743 | 132.5901 | -66.8744 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2360.9867 | 78.1294 | -67.4019 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2658.6926 | -65.6767 | 8.3 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2658.6926 | 111.1914 | 8.93 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2701.205 | -66.5063 | 8.43 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2701.205 | 29.0426 | 7.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.343 | 202] 1.5 [DL + RSX] | 2924.4575 | 105.6254 | 114.7722 |
| Bottom | 1.329 | 202] 1.5 [DL + RSX] | 2966.9699 | -104.5668 | -72.0058 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2560.8557 | 132.6011 | -67.8599 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2603.3681 | 81.5517 | -68.3575 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2924.4575 | -68.843 | 9.08 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2924.4575 | 114.7722 | 9.72 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2966.9699 | -72.0058 | 9.24 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2966.9699 | 33.7815 | 8.71 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.42 | 202] 1.5 [DL + RSX] | 3191.3388 | 106.8329 | 116.5699 |
| Bottom | 1.409 | 202] 1.5 [DL + RSX] | 3233.8512 | -105.9723 | -78.6389 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2802.065 | 131.5645 | -68.544 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2844.5775 | 85.0729 | -68.9855 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3191.3388 | -70.7772 | 9.85 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3191.3388 | 116.5699 | 10.48 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3233.8512 | -78.6389 | 10.08 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3233.8512 | 39.3278 | 9.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.455 | 202] 1.5 [DL + RSX] | 3459.3118 | 108.0086 | 115.7316 |
| Bottom | 1.45 | 202] 1.5 [DL + RSX] | 3501.8242 | -107.5184 | -87.4833 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3042.2716 | 129.7183 | -68.7683 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3084.7841 | 88.2382 | -69.1409 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3459.3118 | -71.0166 | 10.6 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3459.3118 | 115.7316 | 11.22 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3501.8242 | -87.4833 | 10.94 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3501.8242 | 46.8381 | 10.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.526 | 202] 1.5 [DL + RSX] | 3728.3368 | 108.905 | 111.4424 |
| Bottom | 1.529 | 202] 1.5 [DL + RSX] | 3770.8493 | -108.4578 | -98.8438 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3281.5948 | 127.6658 | -68.7935 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3324.1073 | 92.5486 | -69.098 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3728.3368 | -68.9018 | 11.31 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3728.3368 | 111.4424 | 11.9 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3770.8493 | -98.8438 | 11.85 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3770.8493 | 57.8116 | 11.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.6 | 202] 1.5 [DL + RSX] | 3998.6338 | 110.6347 | 103.0479 |
| Bottom | 1.621 | 202] 1.5 [DL + RSX] | 4041.1462 | -111.993 | 111.3287 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3520.3968 | 125.7015 | 53.8311 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3562.9093 | 135.1532 | 54.0779 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3998.6338 | -62.1541 | 11.97 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3998.6338 | 103.0479 | 12.54 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4041.1462 | -66.1984 | 12.14 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4041.1462 | 111.3287 | 12.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P10 | 27340 | 4935 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 4335 | 27340 | 5535 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.679 | 202] 1.5 [DL + RSX] | 4271.8793 | 108.4413 | 142.1187 |
| Bottom | 1.795 | 202] 1.5 [DL + RSX] | 4314.3917 | -108.7116 | -378.2348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3760.4089 | 178.4887 | -172.2426 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3802.9214 | -89.7328 | -172.4103 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4271.8793 | -5.5285 | 11.94 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4271.8793 | 142.1187 | 13.84 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4314.3917 | -378.2348 | 17.24 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2572.3297 | 11.8658 | 7.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.479 | 202] 1.5 [DL + RSX] | 4504.8884 | 105.2058 | 1120.5633 |
| Bottom | 1.227 | 202] 1.5 [DL + RSX] | 4568.6571 | -105.8281 | -233.0549 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3975.6427 | 1160.7373 | -453.1083 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4039.4114 | 223.2488 | -453.3176 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4504.8884 | 1120.5633 | 15.26 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4568.6571 | -233.0549 | 9.9 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4568.6571 | 123.5193 | 9.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.238 | 202] 1.5 [DL + RSX] | 4767.2769 | 104.7111 | 134.3353 |
| Bottom | 1.275 | 202] 1.5 [DL + RSX] | 4831.0456 | -106.5429 | -229.5801 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4245.1093 | 187.3834 | -131.5735 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4308.878 | 219.2824 | -132.0269 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4767.2769 | -69.689 | 9.26 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4767.2769 | 134.3353 | 9.66 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4831.0456 | -229.5801 | 10.36 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4831.0456 | 104.6078 | 9.59 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.28 | 202] 1.5 [DL + RSX] | 5030.6502 | 100.4921 | 128.1186 |
| Bottom | 1.312 | 202] 1.5 [DL + RSX] | 5094.4189 | -104.407 | -191.9264 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4510.4175 | 176.6862 | -118.0699 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4574.1862 | 257.5224 | -118.6693 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5030.6502 | -90.6722 | 9.88 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5030.6502 | 128.1186 | 10.11 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5094.4189 | -191.9264 | 10.62 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5094.4189 | 127.8862 | 10.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.329 | 202] 1.5 [DL + RSX] | 5293.655 | 97.3835 | 154.4687 |
| Bottom | 1.359 | 202] 1.5 [DL + RSX] | 5357.4236 | -102.0607 | -189.6392 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4770.5486 | 193.0114 | -124.7681 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4834.3173 | 276.0122 | -125.4784 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5293.655 | -65.6088 | 10.21 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5293.655 | 154.4687 | 10.76 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5357.4236 | -189.6392 | 11.09 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5357.4236 | 134.6432 | 10.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.373 | 202] 1.5 [DL + RSX] | 5556.0276 | 94.0266 | 148.6516 |
| Bottom | 1.408 | 202] 1.5 [DL + RSX] | 5619.7963 | -99.6328 | -201.4385 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5023.224 | 177.8518 | -123.1415 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5086.9926 | 292.385 | -123.9191 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5556.0276 | -56.4772 | 10.64 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5556.0276 | 148.6516 | 11.21 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5619.7963 | -201.4385 | 11.65 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5619.7963 | 145.2512 | 11.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.413 | 202] 1.5 [DL + RSX] | 5816.9958 | 90.0544 | 129.6776 |
| Bottom | 1.458 | 202] 1.5 [DL + RSX] | 5880.7645 | -96.9498 | -222.4338 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5261.988 | 158.0117 | -118.5399 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5325.7566 | 311.2825 | -119.3245 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5816.9958 | -44.5597 | 11.05 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5816.9958 | 129.6776 | 11.57 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5880.7645 | -222.4338 | 12.26 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5880.7645 | 164.5061 | 11.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.448 | 202] 1.5 [DL + RSX] | 6075.7871 | 85.3313 | 102.1101 |
| Bottom | 1.507 | 202] 1.5 [DL + RSX] | 6139.5557 | -93.5385 | -253.5961 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5482.7453 | 148.3943 | -112.851 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5546.514 | 334.4162 | -113.5779 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6075.7871 | -25.7625 | 11.41 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6075.7871 | 102.1101 | 11.88 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5655.0379 | -394.3857 | 12.91 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6139.5557 | 193.6266 | 12.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.484 | 202] 1.5 [DL + RSX] | 6331.7176 | 80.3215 | -9.8451 |
| Bottom | 1.559 | 202] 1.5 [DL + RSX] | 6395.4863 | -90.8795 | -296.593 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5692.8411 | 161.4661 | -106.7416 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5756.6098 | 368.8684 | -107.3499 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6331.7176 | -9.8451 | 11.79 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6331.7176 | 75.8544 | 12.19 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6395.4863 | -296.593 | 13.67 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5898.1949 | 368.8684 | 13.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.531 | 202] 1.5 [DL + RSX] | 6584.0541 | 72.6006 | -39.4891 |
| Bottom | 1.609 | 202] 1.5 [DL + RSX] | 6649.8471 | -88.0464 | -328.7305 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5899.1253 | 203.3682 | -88.4092 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5964.9183 | 431.1093 | -88.8626 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6584.0541 | -39.4891 | 12.44 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6584.0541 | 97.2969 | 12.79 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6649.8471 | -328.7305 | 14.34 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6649.8471 | 316.1897 | 14.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.98 | 202] 1.5 [DL + RSX] | 6831.5753 | 230.9033 | 192.0394 |
| Bottom | 2.075 | 202] 1.5 [DL + RSX] | 6916.6002 | -233.403 | -491.9233 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5594.3698 | 192.0394 | -88.6058 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5679.3947 | 459.8486 | -88.6584 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6831.5753 | -97.7607 | 13.25 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6831.5753 | 192.0394 | 13.84 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6916.6002 | -491.9233 | 15.85 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6916.6002 | 459.8486 | 15.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P10 | 27340 | 4635 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 3735 | 27340 | 5535 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.06 | 202] 1.5 [DL + RSX] | 7119.527 | 225.1128 | 396.7839 |
| Bottom | 2.151 | 202] 1.5 [DL + RSX] | 7200.908 | 227.3047 | -693.1787 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5850.8304 | 396.7839 | -90.599 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5932.2114 | 642.9355 | -90.6079 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7119.527 | -320.5233 | 15.16 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7119.527 | 396.7839 | 15.63 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7200.908 | -693.1787 | 17.61 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7200.908 | 642.9355 | 17.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.854 | 202] 1.5 [DL + RSX] | 1218.6394 | -138.4608 | 203.0479 |
| Bottom | 1.324 | 202] 1.5 [DL + RSX] | 1261.1518 | 126.1596 | 44.2177 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1218.6394 | 203.0479 | -62.3319 | 130.4435 | 390.2696 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1261.1518 | 44.2177 | -62.4373 | 131.758 | 391.5841 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1568.0283 | 199.9821 | 7.13 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1610.5407 | -26.6033 | 4.84 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1610.5407 | 56.9355 | 5.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.235 | 202] 1.5 [DL + RSX] | 1674.3793 | -119.1372 | -61.2192 |
| Bottom | 1.228 | 202] 1.5 [DL + RSX] | 1716.8917 | 119.8954 | 44.4682 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1309.626 | 57.5437 | 34.9773 | 133.2569 | 393.083 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1352.1384 | 62.8223 | 35.4371 | 134.5714 | 394.3975 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1829.0556 | -80.7577 | 6.2 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1829.0556 | 57.5437 | 5.88 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1871.5681 | -36.8849 | 5.71 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1871.5681 | 62.8223 | 6.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.282 | 202] 1.5 [DL + RSX] | 1936.9328 | -120.6723 | -71.7843 |
| Bottom | 1.248 | 202] 1.5 [DL + RSX] | 1979.4452 | 119.2378 | 47.5968 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1545.9813 | 58.8291 | 38.5372 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1588.4937 | 73.2515 | 39.0475 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2090.1069 | -89.3347 | 7.05 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2090.1069 | 58.8291 | 6.62 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2132.6194 | -37.6356 | 6.45 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2132.6194 | 73.2515 | 6.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.302 | 202] 1.5 [DL + RSX] | 2204.9422 | -118.4257 | -72.5814 |
| Bottom | 1.285 | 202] 1.5 [DL + RSX] | 2247.4546 | 117.4472 | 46.9974 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1779.237 | 65.3126 | 37.6204 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1821.7495 | 76.43 | 38.1768 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2350.5806 | -87.6001 | 7.75 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2350.5806 | 65.3126 | 7.44 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2393.093 | -41.9882 | 7.23 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2393.093 | 76.43 | 7.71 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.353 | 202] 1.5 [DL + RSX] | 2476.424 | -117.1321 | -76.9198 |
| Bottom | 1.333 | 202] 1.5 [DL + RSX] | 2518.9365 | 116.0457 | 49.0389 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2009.6254 | 65.0198 | 38.3349 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2052.1378 | 79.0705 | 38.923 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2610.46 | -89.527 | 8.49 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2610.46 | 65.0198 | 8.15 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2652.9725 | -44.3591 | 7.99 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2652.9725 | 79.0705 | 8.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.401 | 202] 1.5 [DL + RSX] | 2750.0109 | -115.6219 | -79.6398 |
| Bottom | 1.381 | 202] 1.5 [DL + RSX] | 2792.5234 | 114.6049 | 51.501 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2237.27 | 64.6328 | 38.8498 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2279.7825 | 81.309 | 39.4431 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2869.8078 | -89.9659 | 9.22 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2869.8078 | 64.6328 | 8.87 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2912.3202 | -46.2901 | 8.73 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2912.3202 | 81.309 | 9.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.357 | 202] 1.5 [DL + RSX] | 3024.8592 | -114.09 | -81.4072 |
| Bottom | 1.35 | 202] 1.5 [DL + RSX] | 3067.3716 | 113.1515 | 53.7026 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2462.1122 | 63.518 | 39.3445 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2504.6246 | 83.7055 | 39.9115 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3128.7498 | -89.6196 | 9.94 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3128.7498 | 63.518 | 9.57 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3171.2623 | -48.4358 | 9.48 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3171.2623 | 83.7055 | 9.97 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.42 | 202] 1.5 [DL + RSX] | 3300.4532 | -112.4357 | -81.7906 |
| Bottom | 1.414 | 202] 1.5 [DL + RSX] | 3342.9656 | 111.6596 | 56.3542 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2684.0251 | 61.6697 | 39.6251 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2726.5375 | 86.1546 | 40.1383 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3387.4492 | -88.5814 | 10.64 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3387.4492 | 61.6697 | 10.27 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3429.9616 | -51.1073 | 10.24 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3429.9616 | 86.1546 | 10.72 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.538 | 202] 1.5 [DL + RSX] | 3576.4058 | -110.5277 | -80.5201 |
| Bottom | 1.535 | 202] 1.5 [DL + RSX] | 3618.9183 | 109.931 | 60.0455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2902.8397 | 59.2228 | 39.3139 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2945.3522 | 87.3 | 39.7544 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3646.0675 | -87.4505 | 11.34 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3646.0675 | 59.2228 | 10.95 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3688.5799 | -55.1407 | 11.01 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3688.5799 | 87.3 | 11.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.6 | 202] 1.5 [DL + RSX] | 3852.3666 | -108.46 | -78.4604 |
| Bottom | 1.609 | 202] 1.5 [DL + RSX] | 3894.879 | 108.1908 | 76.9499 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3118.3767 | 55.6362 | 42.6987 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3160.8892 | 99.041 | 43.0549 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3904.7711 | -88.1281 | 12.07 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3904.7711 | 55.6362 | 11.62 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3947.2835 | -48.7493 | 11.64 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3947.2835 | 99.041 | 12.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.589 | 202] 1.5 [DL + RSX] | 4127.7396 | -105.9856 | -62.9928 |
| Bottom | 1.623 | 202] 1.5 [DL + RSX] | 4170.252 | 103.8444 | 124.3543 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3330.3737 | 63.8741 | 53.1579 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3372.8862 | 143.3081 | 53.4163 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4163.742 | -78.7037 | 12.66 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4163.742 | 63.8741 | 12.45 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4170.252 | -11.6874 | 11.75 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4206.2544 | 143.3081 | 13.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P11 | 0 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 8806 | 0 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.675 | 202] 1.5 [DL + RSX] | 4400.137 | -107.7457 | 71.8408 |
| Bottom | 1.846 | 202] 1.5 [DL + RSX] | 4442.6494 | 118.8967 | -307.7551 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3537.197 | 92.3704 | -108.854 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3579.7095 | -161.7521 | -108.9257 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4421.235 | -36.8386 | 12.79 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4421.235 | 92.3704 | 13.56 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4463.7475 | -316.3048 | 16.79 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.918 | 202] 1.5 [DL + RSX] | 4709.6953 | -200.2896 | 816.3833 |
| Bottom | 1.617 | 202] 1.5 [DL + RSX] | 4769.9574 | 189.9158 | 170.3913 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3747.7049 | 816.3833 | -239.7395 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3807.967 | 170.3913 | -239.8584 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4709.6953 | 816.3833 | 14.87 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4769.9574 | -52.2783 | 9.71 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4769.9574 | 170.3913 | 10.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.608 | 202] 1.5 [DL + RSX] | 5043.1841 | -181.6215 | 80.4486 |
| Bottom | 1.64 | 202] 1.5 [DL + RSX] | 5103.4462 | 184.3012 | -119.1495 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3992.4441 | 122.1185 | -53.761 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4052.7062 | 151.7336 | -54.0805 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5043.1841 | -26.7229 | 10.07 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5043.1841 | 80.4486 | 10.44 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5103.4462 | -119.1495 | 10.82 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5103.4462 | 74.0468 | 10.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.661 | 202] 1.5 [DL + RSX] | 5375.1393 | -176.4396 | -116.9591 |
| Bottom | 1.68 | 202] 1.5 [DL + RSX] | 5435.4015 | 179.2767 | 108.5636 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4219.1132 | 46.5754 | 65.207 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4279.3753 | 201.9445 | 65.7296 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5375.1393 | -116.9591 | 11.34 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5375.1393 | 2.4035 | 10.55 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5435.4015 | -74.7316 | 11.17 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5435.4015 | 108.5636 | 11.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.686 | 202] 1.5 [DL + RSX] | 5705.129 | -169.6452 | -79.2045 |
| Bottom | 1.722 | 202] 1.5 [DL + RSX] | 5765.3911 | 173.1523 | 120.1226 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4443.6687 | 84.0066 | 57.3492 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4503.9308 | 224.8536 | 58.0368 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5705.129 | -79.2045 | 11.73 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5705.129 | 36.9853 | 11.44 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5765.3911 | -66.5428 | 11.76 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5765.3911 | 120.1226 | 12.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.716 | 202] 1.5 [DL + RSX] | 6032.1629 | -162.7471 | -65.0292 |
| Bottom | 1.763 | 202] 1.5 [DL + RSX] | 6092.4251 | 166.9571 | 128.1689 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4666.046 | 92.2197 | 53.8501 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4726.3082 | 239.1766 | 54.6411 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6032.1629 | -65.0292 | 12.27 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6032.1629 | 39.3263 | 12.09 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6092.4251 | -76.5829 | 12.47 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6092.4251 | 128.1689 | 12.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.76 | 202] 1.5 [DL + RSX] | 6355.6388 | -154.5537 | -59.2461 |
| Bottom | 1.802 | 202] 1.5 [DL + RSX] | 6415.901 | 159.7592 | 144.4659 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4886.8636 | 94.2335 | 53.3138 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4947.1257 | 256.6975 | 54.1382 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6355.6388 | -59.2461 | 12.86 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6355.6388 | 28.4205 | 12.65 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6415.901 | -94.3845 | 13.23 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6415.901 | 144.4659 | 13.57 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.801 | 202] 1.5 [DL + RSX] | 6674.7322 | -145.3766 | -57.7016 |
| Bottom | 1.852 | 202] 1.5 [DL + RSX] | 6734.9943 | 152.0822 | 171.4971 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5106.8891 | 105.1142 | 53.0595 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5167.1513 | 279.8909 | 53.842 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6674.7322 | -57.7016 | 13.48 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6674.7322 | 21.5967 | 13.23 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6734.9943 | -118.8055 | 14.02 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6734.9943 | 171.4971 | 14.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.839 | 202] 1.5 [DL + RSX] | 6988.3331 | -134.0285 | -73.192 |
| Bottom | 1.892 | 202] 1.5 [DL + RSX] | 7048.5953 | 140.2709 | 201.4278 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5327.0154 | 128.8222 | 49.9026 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5387.2775 | 300.8643 | 50.5711 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6988.3331 | -73.192 | 14.2 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6988.3331 | 35.3832 | 13.94 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7048.5953 | -162.9308 | 14.94 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7048.5953 | 201.4278 | 15.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.893 | 202] 1.5 [DL + RSX] | 7295.8989 | -126.3458 | -119.5935 |
| Bottom | 2.001 | 202] 1.5 [DL + RSX] | 7358.0741 | 150.8697 | -306.9222 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5548.458 | 155.7137 | -52.9657 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5610.6332 | 300.3819 | -53.4363 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7295.8989 | -119.5935 | 15.12 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7295.8989 | 63.8542 | 14.74 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7358.0741 | -306.9222 | 16.54 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7358.0741 | 207.1169 | 15.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.556 | 202] 1.5 [DL + RSX] | 7782.1725 | -289.1474 | 273.6025 |
| Bottom | 2.662 | 202] 1.5 [DL + RSX] | 7862.522 | 291.5097 | -512.4086 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5625.1065 | 273.6025 | -120.4037 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5705.456 | 268.0207 | -120.4547 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7440.8661 | -74.6879 | 15.1 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7782.1725 | 273.6025 | 17.14 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7862.522 | -512.4086 | 18.95 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7862.522 | 268.0207 | 17.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P11 | 0 | 9155.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |
| Bottom | Leg 1 | 0 | 8305 | 0 | 10006 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.55 | 202] 1.5 [DL + RSX] | 8272.3314 | -250.7563 | 418.4551 |
| Bottom | 2.622 | 202] 1.5 [DL + RSX] | 8349.2374 | 252.8276 | -606.3831 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6047.666 | 418.4551 | -98.5155 | 204.0732 | 572.3813 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6124.572 | 522.3337 | -98.5239 | 204.0732 | 572.3813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7909.5647 | -232.9101 | 17.11 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8272.3314 | 418.4551 | 19.1 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8349.2374 | -606.3831 | 20.55 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8349.2374 | 522.3337 | 19.97 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.829 | 202] 1.5 [DL + RSX] | 2452.6065 | 148.2155 | 331.3925 |
| Bottom | 1.544 | 202] 1.5 [DL + RSX] | 2495.1189 | -145.6971 | 69.1818 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2301.6069 | 379.9122 | -122.7006 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2344.1194 | 112.5086 | -123.0476 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2452.6065 | 331.3925 | 11.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2422.3862 | -28.829 | 7.13 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2495.1189 | 69.1818 | 7.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.646 | 202] 1.5 [DL + RSX] | 2659.3045 | 142.9187 | -176.1055 |
| Bottom | 1.602 | 202] 1.5 [DL + RSX] | 2701.817 | -142.4904 | 121.0339 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2472.8542 | -52.3354 | 113.4733 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2515.3667 | 170.1426 | 113.9823 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2659.3045 | -102.4801 | 8.81 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1549.9428 | 3.3817 | 4.35 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1575.4503 | -11.9893 | 4.54 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2701.817 | 121.0339 | 9.19 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.651 | 202] 1.5 [DL + RSX] | 2877.0745 | 144.6133 | -119.0812 |
| Bottom | 1.645 | 202] 1.5 [DL + RSX] | 2919.587 | -143.4424 | 109.3345 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2630.9099 | 14.5282 | 91.892 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2673.4223 | 163.1686 | 92.3728 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2877.0745 | -35.8159 | 8.49 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2766.2683 | 14.5282 | 7.89 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1712.3401 | -22.0591 | 5.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2919.587 | 109.3345 | 9.63 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.701 | 202] 1.5 [DL + RSX] | 3104.282 | 144.2865 | -125.8465 |
| Bottom | 1.689 | 202] 1.5 [DL + RSX] | 3146.7945 | -143.3706 | 106.1138 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2790.1019 | 13.3481 | 92.1779 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2832.6144 | 162.4655 | 92.6778 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3104.282 | -35.2428 | 9.11 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2993.2098 | 13.3481 | 8.5 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 1862.0549 | -27.0728 | 5.55 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3146.7945 | 106.1138 | 10.21 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.624 | 202] 1.5 [DL + RSX] | 3340.9428 | 144.1479 | -124.3768 |
| Bottom | 1.613 | 202] 1.5 [DL + RSX] | 3383.4553 | -143.2287 | 103.9054 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2955.1077 | 17.54 | 89.9952 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2997.6201 | 160.896 | 90.5089 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3340.9428 | -29.4075 | 9.69 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3232.1968 | 17.54 | 9.22 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2020.2434 | -31.5553 | 6.05 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3383.4553 | 103.9054 | 10.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.67 | 202] 1.5 [DL + RSX] | 3586.9459 | 143.8717 | -122.6842 |
| Bottom | 1.66 | 202] 1.5 [DL + RSX] | 3629.4583 | -142.982 | 102.1044 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3126.641 | 20.9173 | 87.9931 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3169.1535 | 159.3478 | 88.5078 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3586.9459 | -24.4006 | 10.3 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3482.2488 | 20.9173 | 9.96 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3524.7613 | -5.1738 | 9.86 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3629.4583 | 102.1044 | 11.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.724 | 202] 1.5 [DL + RSX] | 3842.397 | 143.3914 | -120.3274 |
| Bottom | 1.722 | 202] 1.5 [DL + RSX] | 3884.9094 | -142.5797 | 100.3528 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3304.8512 | 23.5829 | 85.9423 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3347.3637 | 158.1676 | 86.437 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3842.397 | -19.9041 | 10.95 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3743.3764 | 23.5829 | 10.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3785.8889 | -11.5023 | 10.68 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3884.9094 | 100.3528 | 12.19 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.787 | 202] 1.5 [DL + RSX] | 4107.4772 | 142.6257 | -116.9704 |
| Bottom | 1.786 | 202] 1.5 [DL + RSX] | 4149.9897 | -141.9497 | 99.1123 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3489.7755 | 25.5591 | 83.7424 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3532.2879 | 157.434 | 84.1962 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4107.4772 | -16.222 | 11.63 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4015.829 | 25.5591 | 11.51 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4058.3414 | -18.3229 | 11.53 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4149.9897 | 99.1123 | 12.9 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.849 | 202] 1.5 [DL + RSX] | 4382.4665 | 141.5019 | -112.2311 |
| Bottom | 1.851 | 202] 1.5 [DL + RSX] | 4424.979 | -140.9739 | 99.4155 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3681.5296 | 27.1125 | 81.3569 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3724.042 | 157.1432 | 81.7564 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4382.4665 | -13.6189 | 12.36 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4299.9782 | 27.1125 | 12.32 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4342.4906 | -25.2911 | 12.41 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4424.979 | 99.4155 | 13.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.912 | 202] 1.5 [DL + RSX] | 4667.6745 | 140.0675 | -105.5382 |
| Bottom | 1.918 | 202] 1.5 [DL + RSX] | 4710.1869 | -140.0958 | 96.2812 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3880.3352 | 28.843 | 76.9498 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3922.8476 | 151.602 | 77.2902 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4667.6745 | -12.1458 | 13.13 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4596.2376 | 28.843 | 13.17 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4638.75 | -39.1436 | 13.43 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4710.1869 | 96.2812 | 14.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.971 | 202] 1.5 [DL + RSX] | 4963.3499 | 136.9468 | -102.6221 |
| Bottom | 2.006 | 202] 1.5 [DL + RSX] | 5005.8624 | -136.3985 | 155.3203 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4086.2772 | 23.8098 | 92.0767 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4128.7897 | 202.6167 | 92.3693 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4963.3499 | -19.462 | 14.06 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4904.9743 | 23.8098 | 13.96 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3132.2314 | -25.5442 | 9.06 | 5 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 5005.8624 | 155.3203 | 16.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P12 | 5045 | 9406 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 8806 | 5045 | 10006 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.024 | 202] 1.5 [DL + RSX] | 5270.836 | 137.0058 | 45.2683 |
| Bottom | 2.184 | 202] 1.5 [DL + RSX] | 5313.3484 | -142.2939 | -310.1683 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4300.8859 | 96.0281 | -134.3415 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4343.3984 | -68.9777 | -134.4539 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5270.836 | -32.5956 | 15.09 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5270.836 | 45.2683 | 15.27 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5270.6234 | -387.6995 | 20.03 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3347.8191 | 22.3577 | 9.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.188 | 202] 1.5 [DL + RSX] | 5549.168 | 213.6892 | 1039.9735 |
| Bottom | 1.814 | 202] 1.5 [DL + RSX] | 5609.3932 | -206.0881 | -123.4236 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4516.975 | 1059.4596 | -390.0759 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4577.2003 | 152.9764 | -390.0367 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5549.168 | 1039.9735 | 18.08 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5609.3932 | -123.4236 | 11.85 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5609.3932 | 45.2595 | 11.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.787 | 202] 1.5 [DL + RSX] | 5837.1751 | 186.8943 | -127.9819 |
| Bottom | 1.805 | 202] 1.5 [DL + RSX] | 5897.4003 | -192.0446 | 86.0574 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4756.2659 | 22.7025 | 82.5313 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4816.4911 | 212.1469 | 82.9232 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5869.1238 | -189.9198 | 12.82 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5869.1238 | 22.7025 | 11.67 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5929.349 | -187.995 | 12.93 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5929.349 | 212.1469 | 13.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.827 | 202] 1.5 [DL + RSX] | 6133.9284 | 187.3846 | -72.0074 |
| Bottom | 1.853 | 202] 1.5 [DL + RSX] | 6194.1536 | -189.8538 | 93.4539 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5002.2669 | 81.6052 | 67.7826 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5062.4921 | 231.8553 | 68.3439 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6207.6553 | -136.0827 | 13.11 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6207.6553 | 81.6052 | 12.74 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6267.8806 | -181.5334 | 13.55 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6267.8806 | 231.8553 | 13.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.852 | 202] 1.5 [DL + RSX] | 6439.9653 | 180.8617 | -51.1412 |
| Bottom | 1.889 | 202] 1.5 [DL + RSX] | 6500.1905 | -184.6843 | 86.7851 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5256.1636 | 98.6833 | 58.8679 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5316.3888 | 235.7244 | 59.5517 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6554.8279 | -111.2102 | 13.62 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6554.8279 | 98.6833 | 13.54 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6615.0531 | -198.4661 | 14.34 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6615.0531 | 235.7244 | 14.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.893 | 202] 1.5 [DL + RSX] | 6755.8045 | 173.789 | -44.9197 |
| Bottom | 1.926 | 202] 1.5 [DL + RSX] | 6816.0297 | -178.4732 | 86.0826 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5518.8316 | 96.1969 | 55.3015 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5579.0568 | 244.3036 | 56.0593 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6910.672 | -103.7174 | 14.27 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6910.672 | 96.1969 | 14.22 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6970.8972 | -217.062 | 15.17 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6970.8972 | 244.3036 | 15.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.936 | 202] 1.5 [DL + RSX] | 7081.7946 | 165.3561 | 35.6526 |
| Bottom | 1.974 | 202] 1.5 [DL + RSX] | 7142.0198 | -170.9621 | 89.8731 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5791.2979 | 100.6307 | 50.6139 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5851.5231 | 256.5096 | 51.3885 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7274.9115 | -99.4472 | 14.95 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7274.9115 | 100.6307 | 14.96 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7335.1367 | -239.93 | 16.04 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7335.1367 | 256.5096 | 16.16 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.978 | 202] 1.5 [DL + RSX] | 7418.3888 | 155.6055 | 35.1593 |
| Bottom | 2.024 | 202] 1.5 [DL + RSX] | 7478.614 | -162.7549 | 97.7972 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6075.0167 | 116.3844 | -48.0345 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6135.2419 | 272.1295 | -48.7564 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7647.2215 | -106.1732 | 15.73 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7647.2215 | 116.3844 | 15.8 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7707.4468 | -269.9584 | 16.98 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7707.4468 | 272.1295 | 17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.017 | 202] 1.5 [DL + RSX] | 7765.9904 | 142.6723 | 44.2173 |
| Bottom | 2.066 | 202] 1.5 [DL + RSX] | 7826.2156 | -149.5968 | 121.6922 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6371.8578 | 146.3535 | -46.9799 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6432.083 | 301.2391 | -47.5883 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8027.1009 | -129.6843 | 16.64 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8027.1009 | 146.3535 | 16.75 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8087.3261 | -299.6592 | 17.93 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8087.3261 | 301.2391 | 17.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.077 | 202] 1.5 [DL + RSX] | 8125.8294 | 133.5705 | 81.3146 |
| Bottom | 2.163 | 202] 1.5 [DL + RSX] | 8187.9665 | -155.0923 | -152.1013 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6684.7726 | 199.9161 | -45.5602 | 203.9482 | 572.0306 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6746.9098 | 325.0226 | -46.0321 | 203.9482 | 572.0306 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8414.9449 | -160.1858 | 17.61 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8414.9449 | 199.9161 | 17.88 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8477.082 | -332.971 | 18.93 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8477.082 | 325.0226 | 18.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.694 | 202] 1.5 [DL + RSX] | 8541.6407 | 322.7281 | 129.0119 |
| Bottom | 2.757 | 202] 1.5 [DL + RSX] | 8621.941 | 325.089 | -281.2625 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7058.7015 | 261.5734 | -56.1041 | 216.6427 | 584.7251 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7139.0018 | 378.1969 | -56.4011 | 216.6427 | 584.7251 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8853.751 | -193.9461 | 18.7 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8853.751 | 261.5734 | 19.17 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8934.0513 | -456.9595 | 20.68 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8934.0513 | 378.1969 | 20.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P12 | 5045 | 9156 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 8306 | 5045 | 10006 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.707 | 203] 1.5 [DL + RSY] | 9322.7618 | 266.3534 | 383.9302 |
| Bottom | 2.782 | 203] 1.5 [DL + RSY] | 9399.6207 | -268.4235 | -587.3905 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7500.2601 | 383.9302 | -77.2905 | 224.0989 | 592.1813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7577.1189 | 529.7927 | -77.3403 | 224.0989 | 592.1813 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9322.7618 | -267.5196 | 20.13 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9322.7618 | 383.9302 | 20.94 | 5 |
| Bottom–Left | Leg 1 | 850 | 203] 1.5 [DL + RSY] | 9399.6207 | -587.3905 | 22.5 | 5 |
| Botttom–Right | Leg 1 | 850 | 203] 1.5 [DL + RSY] | 9399.6207 | 529.7927 | 22.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.893 | 206] [0.9 DL + 1.5 RSX] | 1016.842 | -135.3101 | 154.376 |
| Bottom | 1.654 | 206] [0.9 DL + 1.5 RSX] | 1042.3282 | 133.8342 | 53.1389 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1756.5941 | 285.1717 | -93.4173 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1799.0712 | 112.7571 | -93.7709 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1885.6216 | 233.8737 | 8.5 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1913.9624 | -28.4643 | 5.72 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1928.0986 | 69.9974 | 6.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.659 | 206] [0.9 DL + 1.5 RSX] | 1106.9133 | -132.019 | -108.1414 |
| Bottom | 1.608 | 202] 1.5 [DL + RSX] | 2165.8212 | 151.6635 | 109.6937 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1981.3818 | -28.8144 | 104.6954 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2023.8588 | 157.9613 | 105.2083 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2123.3442 | -80.4009 | 7.02 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1248.8758 | 18.3211 | 3.73 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1274.362 | -19.9765 | 3.82 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2165.8212 | 109.6937 | 7.55 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.644 | 202] 1.5 [DL + RSX] | 2370.8673 | -153.4612 | -112.4008 |
| Bottom | 1.627 | 202] 1.5 [DL + RSX] | 2413.3443 | 152.3678 | 100.9648 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2180.2097 | 23.1978 | 88.4697 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2222.6867 | 153.8979 | 88.9577 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2370.8673 | -28.7372 | 6.99 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2282.4435 | 23.1978 | 6.67 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1415.3991 | -28.0873 | 4.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2413.3443 | 100.9648 | 8.11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.667 | 202] 1.5 [DL + RSX] | 2625.4025 | -152.7772 | -118.3058 |
| Bottom | 1.643 | 202] 1.5 [DL + RSX] | 2667.8795 | 151.9452 | 98.7714 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2365.6736 | 22.8208 | 88.8101 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2408.1507 | 154.1828 | 89.3194 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2625.4025 | -27.4367 | 7.68 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2533.4922 | 22.8208 | 7.36 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2575.9693 | -1.8139 | 7.19 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2667.8795 | 98.7714 | 8.79 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.578 | 202] 1.5 [DL + RSX] | 2886.7835 | -152.2916 | -117.5604 |
| Bottom | 1.568 | 202] 1.5 [DL + RSX] | 2929.2605 | 151.4503 | 97.4503 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2551.9886 | 26.0466 | 87.1683 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2594.4656 | 153.6015 | 87.6902 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2886.7835 | -22.4704 | 8.34 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2796.3159 | 26.0466 | 8.14 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2838.793 | -6.7101 | 7.99 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2929.2605 | 97.4503 | 9.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.627 | 202] 1.5 [DL + RSX] | 3155.0286 | -151.6535 | -116.4801 |
| Bottom | 1.617 | 202] 1.5 [DL + RSX] | 3197.5057 | 150.8415 | 96.346 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2742.0557 | 28.4753 | 85.6089 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2784.5327 | 153.0085 | 86.1272 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3155.0286 | -18.1963 | 9.02 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3068.291 | 28.4753 | 8.93 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3110.768 | -11.9206 | 8.81 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3197.5057 | 96.346 | 10.23 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.675 | 202] 1.5 [DL + RSX] | 3430.4165 | -150.7893 | -114.7683 |
| Bottom | 1.666 | 202] 1.5 [DL + RSX] | 3472.8935 | 150.0617 | 95.158 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2936.6719 | 30.1238 | 83.9464 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2979.1489 | 152.8003 | 84.4373 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3430.4165 | -14.4573 | 9.74 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3349.2221 | 30.1238 | 9.73 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3391.6991 | -17.8259 | 9.68 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3472.8935 | 95.158 | 10.98 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.723 | 202] 1.5 [DL + RSX] | 3713.3111 | -149.6156 | -112.0786 |
| Bottom | 1.717 | 202] 1.5 [DL + RSX] | 3755.7881 | 149.0354 | 94.3514 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3136.2086 | 31.1228 | 82.0751 | 158.1014 | 417.711 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3178.6857 | 153.0072 | 82.5179 | 158.1014 | 417.711 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3713.3111 | -11.5476 | 10.48 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3639.4095 | 31.1228 | 10.55 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3681.8865 | -24.4657 | 10.58 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3755.7881 | 94.3514 | 11.75 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.782 | 202] 1.5 [DL + RSX] | 4004.163 | -148.0542 | -108.0433 |
| Bottom | 1.785 | 202] 1.5 [DL + RSX] | 4046.64 | 147.6374 | 94.9406 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3341.0115 | 31.7965 | 79.9607 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3383.4885 | 153.5081 | 80.3454 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4004.163 | -9.751 | 11.27 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3939.3236 | 31.7965 | 11.39 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3981.8006 | -31.3937 | 11.51 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4046.64 | 94.9406 | 12.57 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.847 | 202] 1.5 [DL + RSX] | 4303.4372 | -146.1544 | -102.1265 |
| Bottom | 1.854 | 202] 1.5 [DL + RSX] | 4345.9142 | 146.3206 | 92.473 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3551.4792 | 32.7307 | 75.9599 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3593.9562 | 149.0589 | 76.2865 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4303.4372 | -9.1606 | 12.09 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4249.4854 | 32.7307 | 12.27 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4291.9624 | -44.7739 | 12.55 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4345.9142 | 92.473 | 13.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.906 | 202] 1.5 [DL + RSX] | 4611.5299 | -142.512 | -99.5148 |
| Bottom | 1.939 | 202] 1.5 [DL + RSX] | 4654.007 | 142.0717 | 147.9329 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3767.8492 | 27.4776 | 90.0663 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3810.3262 | 197.0881 | 90.3515 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4611.5299 | -16.9057 | 13.06 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4570.3712 | 27.4776 | 13.09 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2928.2134 | -31.8822 | 8.58 | 5 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4654.007 | 147.9329 | 15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P13 | 22295 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 22295 | 8806 | 22295 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.955 | 202] 1.5 [DL + RSX] | 4929.8343 | -142.1782 | 42.9715 |
| Bottom | 2.117 | 202] 1.5 [DL + RSX] | 4972.3114 | 147.985 | -300.4243 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3991.6984 | 94.8578 | -131.6097 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4034.1755 | -57.6472 | -131.7224 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4929.8343 | -34.2117 | 14.18 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4929.8343 | 42.9715 | 14.3 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4972.3114 | -136.8498 | 15.73 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3150.2907 | 29.8076 | 9.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.165 | 202] 1.5 [DL + RSX] | 5218.4264 | -221.9782 | 978.0805 |
| Bottom | 1.781 | 202] 1.5 [DL + RSX] | 5278.6878 | 214.1649 | -118.7426 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4216.8584 | 1001.7807 | -371.1399 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4277.1198 | 161.26 | -371.0988 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5224.3646 | 1001.7807 | 17.16 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5284.626 | -228.8407 | 11.94 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5284.626 | 161.26 | 11.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.751 | 202] 1.5 [DL + RSX] | 5516.6887 | -193.9761 | -117.5656 |
| Bottom | 1.772 | 202] 1.5 [DL + RSX] | 5576.9501 | 199.223 | 86.8725 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4465.3733 | 35.6537 | 79.9616 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4525.6347 | 214.0372 | 80.3765 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5564.4374 | -182.6457 | 12.17 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5564.4374 | 35.6537 | 11.15 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5624.6988 | -189.9934 | 12.34 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5624.6988 | 214.0372 | 12.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.792 | 202] 1.5 [DL + RSX] | 5822.7498 | -193.9323 | -66.5466 |
| Bottom | 1.82 | 202] 1.5 [DL + RSX] | 5883.0112 | 196.4496 | 92.6805 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4719.8852 | 88.7865 | 66.4687 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4780.1466 | 231.3872 | 67.0531 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5911.7145 | -133.7447 | 12.51 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5911.7145 | 88.7865 | 12.2 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5971.9759 | -184.3912 | 12.98 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5971.9759 | 231.3872 | 13.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.817 | 202] 1.5 [DL + RSX] | 6137.1428 | -186.7106 | -47.5521 |
| Bottom | 1.854 | 202] 1.5 [DL + RSX] | 6197.4042 | 190.6168 | 85.9342 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4981.494 | 103.2273 | 58.187 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5041.7554 | 234.7713 | 58.8904 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6266.6695 | -110.0863 | 13.04 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6266.6695 | 103.2273 | 12.99 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6326.9309 | -200.7676 | 13.79 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6326.9309 | 234.7713 | 14.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.846 | 202] 1.5 [DL + RSX] | 6460.4355 | -178.959 | -41.7039 |
| Bottom | 1.888 | 202] 1.5 [DL + RSX] | 6520.6969 | 183.7356 | 84.9794 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5251.0762 | 99.5077 | 54.6942 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5311.3376 | 243.1062 | 55.4641 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6629.4184 | -101.9712 | 13.7 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6629.4184 | 99.5077 | 13.68 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6689.6798 | -219.2728 | 14.62 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6689.6798 | 243.1062 | 14.79 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.888 | 202] 1.5 [DL + RSX] | 6793.042 | -169.8453 | 37.2037 |
| Bottom | 1.926 | 202] 1.5 [DL + RSX] | 6853.3034 | 175.5694 | 88.4088 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5529.687 | 102.778 | 50.0773 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5589.9484 | 255.3917 | 50.8549 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6999.7762 | -97.3018 | 14.39 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6999.7762 | 102.778 | 14.43 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7060.0375 | -242.4559 | 15.51 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7060.0375 | 255.3917 | 15.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.93 | 202] 1.5 [DL + RSX] | 7135.4669 | -159.3606 | 36.448 |
| Bottom | 1.975 | 202] 1.5 [DL + RSX] | 7195.7283 | 166.5922 | -97.9203 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5818.8061 | 117.9277 | -49.9656 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5879.0675 | 270.9768 | -50.6827 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7377.4873 | -104.2326 | 15.18 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7377.4873 | 117.9277 | 15.27 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7437.7487 | -273.3726 | 16.46 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7437.7487 | 270.9768 | 16.45 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.968 | 202] 1.5 [DL + RSX] | 7488.1489 | -145.8267 | 44.958 |
| Bottom | 2.017 | 202] 1.5 [DL + RSX] | 7548.4103 | 153.2069 | 120.9292 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6120.3219 | 147.5771 | -48.1161 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6180.5833 | 302.3841 | -48.7155 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7762.0999 | -128.8521 | 16.1 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7762.0999 | 147.5771 | 16.23 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7822.3613 | -302.0279 | 17.42 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7822.3613 | 302.3841 | 17.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.021 | 202] 1.5 [DL + RSX] | 7850.8368 | -134.1085 | 82.5476 |
| Bottom | 2.104 | 202] 1.5 [DL + RSX] | 7913.0113 | 153.7197 | -164.7308 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6435.6657 | 202.2238 | -50.7249 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6497.8402 | 313.7419 | -51.1854 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8152.5406 | -159.6646 | 17.08 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8152.5406 | 202.2238 | 17.37 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8214.7151 | -349.0164 | 18.51 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8214.7151 | 313.7419 | 18.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.607 | 202] 1.5 [DL + RSX] | 8258.5466 | 312.0017 | 135.2935 |
| Bottom | 2.664 | 202] 1.5 [DL + RSX] | 8338.8951 | 314.3639 | -261.5883 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6801.0182 | 270.1828 | -54.3454 | 216.8989 | 585.2024 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6881.3667 | 404.5369 | -54.6317 | 216.8989 | 585.2024 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8583.1108 | -188.5053 | 18.12 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8583.1108 | 270.1828 | 18.69 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8663.4593 | -444.0706 | 20.05 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8663.4593 | 404.5369 | 19.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P13 | 22295 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 22295 | 8304 | 22295 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.607 | 203] 1.5 [DL + RSY] | 9086.5025 | -251.3619 | 365.9301 |
| Bottom | 2.689 | 203] 1.5 [DL + RSY] | 9163.4075 | 253.4333 | -592.8478 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7276.8062 | 365.9301 | -71.0212 | 224.2335 | 592.537 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7353.7112 | 548.2456 | -71.0693 | 224.2335 | 592.537 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9086.5025 | -297.896 | 19.87 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9086.5025 | 365.9301 | 20.34 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9163.4075 | -592.8478 | 22.05 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9163.4075 | 548.2456 | 21.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.588 | 202] 1.5 [DL + RSX] | 1186.0808 | 123.873 | 191.2764 |
| Bottom | 1.141 | 202] 1.5 [DL + RSX] | 1431.7186 | -112.7753 | 43.813 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1186.0808 | 191.2764 | -58.8191 | 129.3595 | 388.969 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1228.5578 | 43.813 | -58.9435 | 130.6729 | 390.2825 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1534.5557 | 188.0794 | 6.88 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1577.0327 | -27.1666 | 4.76 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1577.0327 | 56.2668 | 5.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.144 | 202] 1.5 [DL + RSX] | 1636.1312 | 107.991 | -68.9845 |
| Bottom | 1.129 | 202] 1.5 [DL + RSX] | 1678.6083 | -108.5199 | 46.3629 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1273.3383 | 52.0795 | 38.6201 | 132.0575 | 391.6671 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1315.8153 | 64.7117 | 39.0864 | 133.371 | 392.9805 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1790.1736 | -90.5536 | 6.24 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1790.1736 | 52.0795 | 5.7 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1832.6506 | -35.6739 | 5.59 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1832.6506 | 64.7117 | 6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.191 | 202] 1.5 [DL + RSX] | 1891.5571 | 109.9064 | -77.3064 |
| Bottom | 1.165 | 202] 1.5 [DL + RSX] | 1934.0342 | -108.6443 | 50.1859 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1503.656 | 55.8245 | 41.7077 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1546.133 | 75.6373 | 42.2361 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2047.0039 | -97.082 | 7.04 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2047.0039 | 55.8245 | 6.47 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2089.481 | -35.6747 | 6.31 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2089.481 | 75.6373 | 6.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.23 | 202] 1.5 [DL + RSX] | 2153.4803 | 108.7256 | -77.2542 |
| Bottom | 1.212 | 202] 1.5 [DL + RSX] | 2195.9573 | -107.8117 | 49.8738 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1731.4926 | 63.4573 | 40.722 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1773.9696 | 78.8213 | 41.3039 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2304.1636 | -94.6078 | 7.72 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2304.1636 | 63.4573 | 7.29 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2346.6406 | -39.628 | 7.08 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2346.6406 | 78.8213 | 7.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.285 | 202] 1.5 [DL + RSX] | 2419.9516 | 108.2719 | -81.0512 |
| Bottom | 1.264 | 202] 1.5 [DL + RSX] | 2462.4286 | -107.2519 | 51.9725 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1956.9643 | 63.7022 | 41.4156 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1999.4413 | 81.416 | 42.0286 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2561.5767 | -95.8265 | 8.45 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2561.5767 | 63.7022 | 8.01 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2604.0537 | -41.9666 | 7.82 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2604.0537 | 81.416 | 8.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.338 | 202] 1.5 [DL + RSX] | 2689.4815 | 107.5803 | -83.4078 |
| Bottom | 1.32 | 202] 1.5 [DL + RSX] | 2731.9585 | -106.6049 | 54.3481 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2180.0976 | 63.4483 | 41.9015 | 139.0274 | 398.637 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2222.5747 | 83.7902 | 42.5101 | 139.0274 | 398.637 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2819.2505 | -95.516 | 9.17 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2819.2505 | 63.4483 | 8.72 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2861.7275 | -44.3286 | 8.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2861.7275 | 83.7902 | 9.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.307 | 202] 1.5 [DL + RSX] | 2961.1034 | 106.8176 | -84.9474 |
| Bottom | 1.3 | 202] 1.5 [DL + RSX] | 3003.5804 | -105.8964 | 56.369 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2400.7767 | 62.2672 | 42.3264 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2443.2537 | 86.5534 | 42.8932 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3077.2652 | -94.4936 | 9.87 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3077.2652 | 62.2672 | 9.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3119.7423 | -47.3655 | 9.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3119.7423 | 86.5534 | 9.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.373 | 202] 1.5 [DL + RSX] | 3234.2094 | 105.8976 | -85.2349 |
| Bottom | 1.367 | 202] 1.5 [DL + RSX] | 3276.6865 | -105.109 | 58.7632 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2618.8581 | 60.3443 | 42.4931 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2661.3351 | 89.4859 | 42.9908 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3335.7309 | -93.0331 | 10.57 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3335.7309 | 60.3443 | 10.11 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3378.208 | -51.2466 | 10.1 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3378.208 | 89.4859 | 10.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.493 | 202] 1.5 [DL + RSX] | 3508.3517 | 104.6984 | -83.9982 |
| Bottom | 1.489 | 202] 1.5 [DL + RSX] | 3550.8288 | -104.0588 | 62.0674 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2834.1967 | 57.9404 | 42.0268 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2876.6737 | 91.0077 | 42.4425 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3594.7494 | -91.8717 | 11.27 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3594.7494 | 57.9404 | 10.8 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3637.2264 | -56.641 | 10.9 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3637.2264 | 91.0077 | 11.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.558 | 202] 1.5 [DL + RSX] | 3783.1437 | 103.3115 | -82.1386 |
| Bottom | 1.565 | 202] 1.5 [DL + RSX] | 3825.6207 | -102.9504 | 78.0602 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3046.6708 | 54.4797 | 45.1395 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3089.1479 | 102.5232 | 45.4722 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3854.4273 | -92.9884 | 12.01 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3854.4273 | 54.4797 | 11.47 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3896.9043 | -51.9717 | 11.56 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3896.9043 | 102.5232 | 12.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.553 | 202] 1.5 [DL + RSX] | 4057.9774 | 101.5336 | -67.369 |
| Bottom | 1.584 | 202] 1.5 [DL + RSX] | 4100.4545 | -99.3606 | 124.6466 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3256.1051 | 62.4479 | 55.6294 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3298.5821 | 146.6835 | 55.8768 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4114.8994 | -84.7543 | 12.62 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4114.8994 | 62.4479 | 12.31 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4157.3765 | -35.8661 | 12.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4157.3765 | 146.6835 | 13.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P14 | 27340 | 9405.5 | 1199 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |
| Bottom | Leg 1 | 27340 | 8806 | 27340 | 10005 | 1199 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.639 | 202] 1.5 [DL + RSX] | 4330.4223 | 103.737 | 67.3569 |
| Bottom | 1.806 | 202] 1.5 [DL + RSX] | 4372.8993 | -114.2629 | -305.5625 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3460.964 | 90.2922 | -107.2468 | 144.3262 | 403.9357 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3503.441 | -156.978 | -107.3186 | 144.3262 | 403.9357 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4374.3505 | -44.0281 | 12.77 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4374.3505 | 90.2922 | 13.42 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4416.8275 | -317.0288 | 16.69 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.87 | 202] 1.5 [DL + RSX] | 4636.9076 | 193.4431 | 801.1413 |
| Bottom | 1.577 | 202] 1.5 [DL + RSX] | 4697.169 | -183.26 | 171.947 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3692.4086 | 801.1413 | -234.3318 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3752.67 | 171.947 | -234.4543 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4645.0687 | 812.4688 | 14.72 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4705.3301 | -115.6077 | 10.02 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4705.3301 | 237.1728 | 10.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.573 | 202] 1.5 [DL + RSX] | 4967.2887 | 175.8051 | 79.5315 |
| Bottom | 1.604 | 202] 1.5 [DL + RSX] | 5027.5501 | -178.464 | -115.38 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3908.1767 | 125.9631 | -52.5925 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3968.4381 | 158.065 | -52.9558 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4967.2887 | -26.7164 | 9.92 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4967.2887 | 79.5315 | 10.28 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5027.5501 | -115.38 | 10.65 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5027.5501 | 77.8069 | 10.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.628 | 202] 1.5 [DL + RSX] | 5296.6732 | 171.2791 | -114.7262 |
| Bottom | 1.648 | 202] 1.5 [DL + RSX] | 5356.9345 | -174.0944 | 111.2523 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4131.2386 | 52.2867 | 65.7494 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4191.5 | 206.1044 | 66.3223 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5296.6732 | -114.7262 | 11.17 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5296.6732 | 4.0374 | 10.41 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5356.9345 | -72.0836 | 11 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5356.9345 | 111.2523 | 11.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.655 | 202] 1.5 [DL + RSX] | 5624.5285 | 165.2044 | -77.6816 |
| Bottom | 1.692 | 202] 1.5 [DL + RSX] | 5684.7899 | -168.6634 | 121.7948 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4352.5862 | 87.8717 | 57.9332 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4412.8476 | 227.1686 | 58.6649 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5624.5285 | -77.6816 | 11.56 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5624.5285 | 38.0012 | 11.28 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5684.7899 | -64.8843 | 11.59 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5684.7899 | 121.7948 | 11.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.688 | 202] 1.5 [DL + RSX] | 5949.8761 | 158.9759 | -64.2893 |
| Bottom | 1.734 | 202] 1.5 [DL + RSX] | 6010.1375 | -163.1245 | 128.9906 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4572.1315 | 93.8115 | 54.5303 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4632.3929 | 240.4178 | 55.349 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5949.8761 | -64.2893 | 12.1 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5949.8761 | 39.8439 | 11.93 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6010.1375 | -75.6807 | 12.3 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6010.1375 | 128.9906 | 12.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.734 | 202] 1.5 [DL + RSX] | 6272.1164 | 151.455 | -59.2635 |
| Bottom | 1.775 | 202] 1.5 [DL + RSX] | 6332.3778 | -156.6042 | 144.4896 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4790.4794 | 93.9147 | 54.0373 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4850.7408 | 257.5289 | 54.8698 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6272.1164 | -59.2635 | 12.7 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6272.1164 | 28.6746 | 12.49 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6332.3778 | -94.045 | 13.06 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6332.3778 | 144.4896 | 13.41 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.776 | 202] 1.5 [DL + RSX] | 6590.425 | 142.8824 | -58.3799 |
| Bottom | 1.827 | 202] 1.5 [DL + RSX] | 6650.6864 | -149.3993 | 171.1813 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5008.4027 | 103.7518 | 53.9276 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5068.6641 | 281.2376 | 54.7014 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6590.425 | -58.3799 | 13.32 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6590.425 | 21.614 | 13.06 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6650.6864 | -118.4394 | 13.85 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6650.6864 | 171.1813 | 14.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.817 | 202] 1.5 [DL + RSX] | 6903.7276 | 132.4839 | -73.6215 |
| Bottom | 1.871 | 202] 1.5 [DL + RSX] | 6963.989 | -138.993 | 201.5158 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5226.853 | 127.7891 | 51.0184 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5287.1144 | 303.9061 | 51.6677 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6903.7276 | -73.6215 | 14.04 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6903.7276 | 35.2265 | 13.77 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6963.989 | -161.8587 | 14.77 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6963.989 | 201.5158 | 15.04 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.867 | 202] 1.5 [DL + RSX] | 7210.5937 | 123.3441 | -119.4962 |
| Bottom | 1.969 | 202] 1.5 [DL + RSX] | 7272.7681 | -145.0541 | -314.8986 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5446.2 | 155.9268 | -56.6831 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5508.3745 | 295.0425 | -57.1357 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7210.5937 | -119.4962 | 14.96 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7210.5937 | 63.5518 | 14.57 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7272.7681 | -314.8986 | 16.43 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7272.7681 | 196.4385 | 15.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.521 | 202] 1.5 [DL + RSX] | 7693.8385 | 283.1104 | 284.2849 |
| Bottom | 2.623 | 202] 1.5 [DL + RSX] | 7774.1871 | -285.4726 | -514.4229 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5558.2659 | 284.2849 | -124.0854 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5638.6145 | 265.1694 | -124.1362 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7392.1648 | -63.7937 | 14.93 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7693.8385 | 284.2849 | 17.04 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7774.1871 | -514.4229 | 18.79 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7774.1871 | 265.1694 | 17.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P14 | 27340 | 9154.5 | 1701 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |
| Bottom | Leg 1 | 27340 | 8304 | 27340 | 10005 | 1701 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.573 | 202] 1.5 [DL + RSX] | 8170.5656 | 262.4912 | 419.3838 |
| Bottom | 2.645 | 202] 1.5 [DL + RSX] | 8247.4706 | 264.5626 | -611.1 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5967.8285 | 419.3838 | -100.1004 | 204.0707 | 572.3742 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6044.7335 | 519.5144 | -100.1087 | 204.0707 | 572.3742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7848.2921 | -239.7952 | 17.04 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8170.5656 | 419.3838 | 18.91 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8247.4706 | -611.1 | 20.39 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8247.4706 | 519.5144 | 19.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.92 | 202] 1.5 [DL + RSX] | 1632.0963 | 292.2286 | -800.3321 |
| Bottom | 3.683 | 206] [0.9 DL + 1.5 RSX] | 874.2696 | -217.8698 | 191.2412 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1803.2854 | -616.595 | 387.704 | 161.5635 | 507.9982 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1859.9686 | 353.1207 | 388.0907 | 163.1415 | 509.5763 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2327.0869 | -717.329 | 10.45 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1398.0711 | -12.0322 | 3.01 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2383.7702 | 276.5133 | 7.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.08 | 206] [0.9 DL + 1.5 RSX] | 956.6089 | 200.7367 | -147.7521 |
| Bottom | 3.084 | 206] [0.9 DL + 1.5 RSX] | 990.6189 | -202.6868 | 164.8527 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2044.4294 | 75.1424 | 164.2383 | 167.04 | 513.4748 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2101.1126 | 307.8716 | 164.933 | 167.04 | 513.4748 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2602.3553 | -15.5995 | 5.54 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2404.276 | 75.1424 | 5.6 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1548.5449 | -43.7211 | 3.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2659.0386 | 230.8903 | 7.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.316 | 206] [0.9 DL + 1.5 RSX] | 1071.1609 | 207.0163 | -169.5826 |
| Bottom | 2.238 | 206] [0.9 DL + 1.5 RSX] | 1105.1708 | -204.8245 | 160.5785 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2284.1006 | 45.4609 | 176.9774 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2340.7839 | 307.6202 | 177.6364 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2877.9483 | -55.8746 | 6.43 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2652.2857 | 45.4609 | 5.88 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1699.0184 | -54.1814 | 3.96 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2934.6315 | 223.9382 | 7.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.177 | 206] [0.9 DL + 1.5 RSX] | 1184.3294 | 205.216 | -173.2368 |
| Bottom | 2.105 | 206] [0.9 DL + 1.5 RSX] | 1218.3393 | -203.7733 | 159.126 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2523.3678 | 46.0421 | 177.2608 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2580.0511 | 309.2999 | 177.9245 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3154.3086 | -55.618 | 7.01 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2899.9296 | 46.0421 | 6.4 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1849.2801 | -60.6743 | 4.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3210.9919 | 221.2824 | 8.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.29 | 206] [0.9 DL + 1.5 RSX] | 1296.55 | 204.6629 | -173.3856 |
| Bottom | 2.206 | 206] [0.9 DL + 1.5 RSX] | 1330.5599 | -203.1041 | 158.3648 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2763.2886 | 48.5584 | 176.0371 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2819.9719 | 309.6107 | 176.7089 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3432.2313 | -52.2569 | 7.56 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3147.688 | 48.5584 | 6.94 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3204.3712 | -5.2787 | 6.72 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3488.9146 | 219.2312 | 8.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.146 | 206] [0.9 DL + 1.5 RSX] | 1408.1625 | 203.7346 | -172.6837 |
| Bottom | 2.063 | 206] [0.9 DL + 1.5 RSX] | 1442.1725 | -202.2265 | 157.6102 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3004.843 | 49.288 | 174.7007 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3061.5262 | 309.7051 | 175.3661 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3712.5183 | -49.3863 | 8.12 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3396.0081 | 49.288 | 7.46 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3452.6913 | -12.1067 | 7.29 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3769.2016 | 217.1299 | 9.55 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.876 | 202] 1.5 [DL + RSX] | 3995.8733 | 238.5883 | -225.646 |
| Bottom | 1.859 | 202] 1.5 [DL + RSX] | 4052.5566 | -236.4305 | 214.76 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3248.9393 | 48.2321 | 173.1235 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3305.6226 | 310.5081 | 173.7576 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3995.8733 | -46.8175 | 8.69 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3645.2981 | 48.2321 | 7.97 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3701.9814 | -19.8468 | 7.87 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 3701.9814 | 310.5081 | 10.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.881 | 202] 1.5 [DL + RSX] | 4282.9118 | 234.6128 | -221.7157 |
| Bottom | 1.875 | 202] 1.5 [DL + RSX] | 4339.5951 | -232.5651 | 212.4873 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3496.4393 | 45.6265 | 171.1357 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3553.1226 | 312.4858 | 171.7135 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4282.9118 | -44.8529 | 9.27 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3895.9342 | 45.6265 | 8.47 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3952.6174 | -28.9334 | 8.46 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4339.5951 | 71.065 | 9.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.898 | 202] 1.5 [DL + RSX] | 4574.1588 | 229.8779 | -216 |
| Bottom | 1.895 | 202] 1.5 [DL + RSX] | 4630.8421 | -228.0262 | 211.2857 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3748.1622 | 42.0189 | 168.6556 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3804.8454 | 315.7649 | 169.1616 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4574.1588 | -43.8098 | 9.87 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4148.2613 | 42.0189 | 8.97 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4204.9446 | -39.1332 | 9.07 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4630.8421 | 211.2857 | 11.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.909 | 202] 1.5 [DL + RSX] | 4870.0479 | 224.1189 | -208.0056 |
| Bottom | 1.911 | 202] 1.5 [DL + RSX] | 4926.7312 | -222.518 | 211.5824 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4004.8994 | 38.2759 | 165.1283 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4061.5827 | 318.7107 | 165.562 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4870.0479 | -43.7355 | 10.49 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4402.6032 | 38.2759 | 9.47 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4459.2865 | -49.5693 | 9.68 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4926.7312 | 211.5824 | 11.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.915 | 202] 1.5 [DL + RSX] | 5171.0613 | 217.2913 | -197.9145 |
| Bottom | 1.914 | 202] 1.5 [DL + RSX] | 5227.7446 | -216.7512 | 182.3711 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4267.4297 | 35.5668 | 152.4523 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4324.113 | 293.298 | 152.8227 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5171.0613 | -44.9057 | 11.12 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4659.3771 | 35.5668 | 9.98 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5227.7446 | -0.1783 | 10.89 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5227.7446 | 182.3711 | 12.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P15 | 8575 | 10606 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 11406 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.921 | 202] 1.5 [DL + RSX] | 5476.2211 | 206.6183 | -220.5705 |
| Bottom | 2.032 | 202] 1.5 [DL + RSX] | 5532.9044 | -204.188 | 479.7455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4535.785 | -17.7103 | 253.106 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4592.4683 | 612.8593 | 253.1967 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5476.2211 | -97.7767 | 12.17 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3027.0417 | 45.9592 | 6.67 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5532.9044 | 479.7455 | 15.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.834 | 202] 1.5 [DL + RSX] | 5822.3816 | 219.3116 | -1402.8099 |
| Bottom | 1.534 | 202] 1.5 [DL + RSX] | 5900.3211 | -215.0926 | 304.0702 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4839.7575 | -1100.2793 | 599.2873 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4917.697 | 572.8794 | 599.31 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5822.3816 | -1175.6399 | 13.68 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5292.3483 | -217.7385 | 8.92 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5900.3211 | 304.0702 | 10.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.51 | 202] 1.5 [DL + RSX] | 6179.4701 | 198.1436 | -223.9653 |
| Bottom | 1.549 | 202] 1.5 [DL + RSX] | 6257.4096 | -202.6642 | 300.9847 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5125.0413 | 88.9942 | 222.921 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5202.9808 | 604.7016 | 223.4304 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6179.4701 | -52.4605 | 9.58 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5537.6873 | 88.9942 | 8.76 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5615.6268 | -233.6092 | 9.47 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5615.6268 | 604.7016 | 11.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.542 | 202] 1.5 [DL + RSX] | 6535.6572 | 193.2404 | -198.311 |
| Bottom | 1.576 | 202] 1.5 [DL + RSX] | 6613.5967 | -196.2767 | 267.6395 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5412.1035 | 117.023 | 203.595 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5490.0429 | 593.6098 | 204.3097 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6535.6572 | -30.8405 | 10.03 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5859.2436 | 117.023 | 9.36 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5937.1831 | -278.4891 | 10.15 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6613.5967 | 267.6395 | 11.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.565 | 202] 1.5 [DL + RSX] | 6890.7847 | 182.7632 | -207.3492 |
| Bottom | 1.599 | 202] 1.5 [DL + RSX] | 6968.7242 | -187.1042 | 256.7058 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5701.7878 | 95.4701 | 202.8155 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5779.7273 | 605.169 | 203.6676 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6890.7847 | -49.3193 | 10.64 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6179.2168 | 95.4701 | 9.76 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6257.1563 | -307.5488 | 10.75 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6968.7242 | 256.7058 | 11.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.586 | 202] 1.5 [DL + RSX] | 7244.7409 | 171.1086 | -195.3838 |
| Bottom | 1.619 | 202] 1.5 [DL + RSX] | 7322.6804 | -176.4567 | 252.8018 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5994.4679 | 94.1271 | 196.1116 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6072.4074 | 625.9996 | 197.0481 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7244.7409 | -49.9884 | 11.18 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6497.7843 | 94.1271 | 10.23 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6575.7238 | -342.288 | 11.38 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7322.6804 | 252.8018 | 12.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.614 | 202] 1.5 [DL + RSX] | 7597.4241 | 157.4798 | -177.1395 |
| Bottom | 1.65 | 202] 1.5 [DL + RSX] | 7675.3636 | -164.0827 | 253.7925 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6290.5644 | 108.0521 | 187.5343 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6368.5038 | 655.9279 | 188.4868 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7597.4241 | -51.5781 | 11.72 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6815.3467 | 108.0521 | 10.77 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6893.2862 | -388.0728 | 12.05 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7675.3636 | 253.7925 | 12.68 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.637 | 202] 1.5 [DL + RSX] | 7948.5765 | 141.5408 | -158.4008 |
| Bottom | 1.679 | 202] 1.5 [DL + RSX] | 8026.5159 | -149.6089 | 261.1661 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6590.4148 | 146.5972 | 177.6935 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6668.3543 | 697.0886 | 178.5796 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7948.5765 | -53.7075 | 12.27 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7132.3252 | 146.5972 | 11.41 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8026.5159 | -12.2906 | 12.21 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8026.5159 | 261.1661 | 13.24 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.655 | 202] 1.5 [DL + RSX] | 8297.5017 | 122.9303 | -150.4122 |
| Bottom | 1.707 | 202] 1.5 [DL + RSX] | 8375.4411 | -133.0721 | 280.366 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6894.1298 | 216.601 | 166.4919 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6972.0693 | 751.4936 | 167.2347 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8297.5017 | -46.0518 | 12.76 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7448.9999 | 216.601 | 12.18 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8375.4411 | -49.5956 | 12.9 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7526.9394 | 751.4936 | 14.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.675 | 202] 1.5 [DL + RSX] | 8644.4772 | 100.1586 | -10.4937 |
| Bottom | 1.736 | 202] 1.5 [DL + RSX] | 8724.891 | -115.9432 | 309.9087 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7201.6774 | 314.6357 | 149.007 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7282.0911 | 816.7508 | 149.5748 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8644.4772 | -10.4937 | 13.14 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7766.722 | 314.6357 | 13.07 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8724.891 | -90.7067 | 13.59 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8724.891 | 309.9087 | 14.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.225 | 202] 1.5 [DL + RSX] | 8984.7405 | 325.8683 | -197.1983 |
| Bottom | 2.296 | 202] 1.5 [DL + RSX] | 9088.6598 | 328.9235 | 453.8777 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7511.3801 | 450.7994 | 131.1793 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7615.2994 | 1021.7952 | 131.566 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8984.7405 | -197.1983 | 14.43 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8984.7405 | 57.4173 | 13.85 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9088.6598 | -153.0539 | 14.4 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9088.6598 | 453.8777 | 15.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P15 | 8575 | 10906 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 9806 | 8575 | 12006 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.203 | 202] 1.5 [DL + RSX] | 9362.928 | 288.9179 | -351.7739 |
| Bottom | 2.244 | 202] 1.5 [DL + RSX] | 9462.3936 | 291.5969 | 454.512 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7875.391 | 642.8502 | 135.72 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7974.8566 | 1190.4715 | 135.7871 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9362.928 | -351.7739 | 15.64 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9362.928 | 152.7974 | 14.82 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9462.3936 | -431.6097 | 16.12 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9462.3936 | 454.512 | 16.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.018 | 202] 1.5 [DL + RSX] | 1268.4693 | -281.1408 | -681.137 |
| Bottom | 3.937 | 206] [0.9 DL + 1.5 RSX] | 649.8976 | 211.4848 | 181.3401 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1404.0245 | -536.8063 | 332.7957 | 150.448 | 496.8828 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1460.7077 | 322.8616 | 333.1028 | 152.0261 | 498.4609 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1994.4391 | -612.4823 | 8.94 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1240.3122 | -16.3783 | 2.71 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2051.1223 | 257.9609 | 6.29 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.348 | 206] [0.9 DL + 1.5 RSX] | 734.2701 | -194.3242 | -153.0492 |
| Bottom | 3.35 | 206] [0.9 DL + 1.5 RSX] | 768.2801 | 196.6042 | 163.0481 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1646.5868 | 62.5373 | 159.8995 | 157.201 | 503.6358 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1703.2701 | 292.6189 | 160.5902 | 158.779 | 505.2138 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2263.025 | -196.8577 | 6.25 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2100.0321 | 62.5373 | 4.86 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1384.7182 | -41.7873 | 3.21 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2319.7082 | 225.756 | 6.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.442 | 206] [0.9 DL + 1.5 RSX] | 851.161 | -201.0375 | -167.5119 |
| Bottom | 2.37 | 206] [0.9 DL + 1.5 RSX] | 885.1709 | 199.0713 | 159.8106 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1887.9209 | 44.8717 | 168.5877 | 193.845 | 540.2798 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1944.6042 | 293.0763 | 169.2507 | 195.7112 | 542.146 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2533.2309 | -49.9232 | 5.67 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2342.5689 | 44.8717 | 5.23 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1530.4809 | -51.922 | 3.59 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2589.9142 | 220.0992 | 7.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.304 | 206] [0.9 DL + 1.5 RSX] | 966.9942 | -199.4739 | -170.1531 |
| Bottom | 2.239 | 206] [0.9 DL + 1.5 RSX] | 1001.0042 | 198.2756 | 158.6283 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2129.1218 | 46.1749 | 168.5561 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2185.8051 | 294.5957 | 169.2283 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2805.3578 | -49.2572 | 6.23 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2586.3182 | 46.1749 | 5.75 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1677.2402 | -57.997 | 3.95 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2862.0411 | 217.778 | 7.66 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.434 | 206] [0.9 DL + 1.5 RSX] | 1082.0545 | -199.1695 | -169.8648 |
| Bottom | 2.359 | 206] [0.9 DL + 1.5 RSX] | 1116.0645 | 197.8457 | 157.9604 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2370.9496 | 48.8474 | 167.2151 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2427.6329 | 294.6736 | 167.8969 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3079.7896 | -45.6402 | 6.77 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2831.3555 | 48.8474 | 6.28 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2888.0388 | -5.1853 | 6.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3136.4728 | 215.858 | 8.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.29 | 206] [0.9 DL + 1.5 RSX] | 1196.5832 | -198.4591 | -168.8219 |
| Bottom | 2.216 | 206] [0.9 DL + 1.5 RSX] | 1230.5931 | 197.1863 | 157.1441 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2614.1563 | 49.4658 | 165.7466 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2670.8396 | 294.5778 | 166.4193 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3356.9782 | -42.5558 | 7.33 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3077.7954 | 49.4658 | 6.8 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3134.4786 | -11.8863 | 6.62 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3413.6614 | 213.6824 | 8.78 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.931 | 206] [0.9 DL + 1.5 RSX] | 1310.8465 | -197.4395 | -167.0721 |
| Bottom | 1.88 | 206] [0.9 DL + 1.5 RSX] | 1344.8565 | 196.2657 | 155.9647 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2859.4539 | 48.1223 | 164.0334 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2916.1371 | 295.3543 | 164.6688 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3637.3157 | -39.8881 | 7.89 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3325.749 | 48.1223 | 7.3 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3382.4322 | -19.8869 | 7.2 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3693.999 | 211.0582 | 9.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.829 | 206] [0.9 DL + 1.5 RSX] | 1425.1451 | -195.9139 | -164.2286 |
| Bottom | 1.793 | 202] 1.5 [DL + RSX] | 3977.8256 | 226.9855 | 208.3137 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3107.5344 | 45.2467 | 161.8994 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3164.2176 | 297.4538 | 162.4717 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3921.1423 | -37.9185 | 8.47 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3575.3249 | 45.2467 | 7.8 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3632.0081 | -29.6063 | 7.8 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3977.8256 | 208.3137 | 9.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.814 | 202] 1.5 [DL + RSX] | 4208.7395 | -224.284 | -209.1524 |
| Bottom | 1.814 | 202] 1.5 [DL + RSX] | 4265.4228 | 222.9016 | 206.4543 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3359.0692 | 41.524 | 159.3016 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3415.7525 | 300.9698 | 159.7971 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4208.7395 | -36.9432 | 9.06 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3826.625 | 41.524 | 8.3 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3883.3082 | -40.5342 | 8.41 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4265.4228 | 53.9813 | 9.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.827 | 202] 1.5 [DL + RSX] | 4500.3315 | -218.933 | -201.445 |
| Bottom | 1.832 | 202] 1.5 [DL + RSX] | 4557.0148 | 217.8281 | 205.8413 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3614.7222 | 38.0084 | 155.6527 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3671.4055 | 304.0538 | 156.0749 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4500.3315 | -36.8081 | 9.66 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4079.7538 | 38.0084 | 8.8 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4136.437 | -51.7939 | 9.02 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4557.0148 | 205.8413 | 11.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.834 | 202] 1.5 [DL + RSX] | 4796.19 | -212.4861 | -191.9665 |
| Bottom | 1.836 | 202] 1.5 [DL + RSX] | 4852.8733 | 212.4687 | 177.3922 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3875.139 | 35.6247 | 143.3667 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3931.8223 | 280.0214 | 143.7271 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4796.19 | -37.8335 | 10.29 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4334.8983 | 35.6247 | 9.31 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4852.8733 | -10.1622 | 10.19 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4852.8733 | 177.3922 | 11.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P16 | 18765 | 10605 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 11405 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.838 | 202] 1.5 [DL + RSX] | 5095.1883 | -202.303 | -213.5836 |
| Bottom | 1.942 | 202] 1.5 [DL + RSX] | 5151.8716 | 200.6422 | 444.9066 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4140.3043 | -15.0703 | 235.8979 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4196.9876 | 576.5983 | 235.9681 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5095.1883 | -89.1082 | 11.31 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2844.7503 | 45.4681 | 6.28 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5151.8716 | 444.9066 | 14.21 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.758 | 202] 1.5 [DL + RSX] | 5433.7301 | -215.8137 | -1300.0597 |
| Bottom | 1.473 | 202] 1.5 [DL + RSX] | 5511.6696 | 212.0146 | 299.4774 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4438.8267 | -1010.7065 | 561.2598 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4516.7662 | 561.3674 | 561.2765 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5433.7301 | -1092.2015 | 12.75 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4964.2502 | -221.7407 | 8.44 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5511.6696 | 299.4774 | 9.59 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.441 | 202] 1.5 [DL + RSX] | 5784.9062 | -194.7186 | -212.1094 |
| Bottom | 1.483 | 202] 1.5 [DL + RSX] | 5862.8457 | 199.6462 | 295.8493 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4719.364 | 104.3574 | 211.3923 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4797.3035 | 591.5113 | 211.9099 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5784.9062 | -35.4868 | 8.91 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5209.2278 | 104.3574 | 8.32 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5287.1673 | -237.7882 | 8.99 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5862.8457 | 295.8493 | 10.11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.473 | 202] 1.5 [DL + RSX] | 6134.5476 | -190.0684 | -187.2834 |
| Bottom | 1.509 | 202] 1.5 [DL + RSX] | 6212.4871 | 193.4825 | 262.0617 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5000.927 | 132.0179 | 192.3774 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5078.8665 | 578.6102 | 193.1116 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6134.5476 | -15.659 | 9.36 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5530.1436 | 132.0179 | 8.92 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5608.0831 | -282.7066 | 9.67 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5608.0831 | 578.6102 | 10.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.495 | 202] 1.5 [DL + RSX] | 6482.5409 | -179.6807 | -197.0708 |
| Bottom | 1.531 | 202] 1.5 [DL + RSX] | 6560.4804 | 184.4619 | 250.7767 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5284.4021 | 109.3439 | 192.2111 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5362.3416 | 589.4709 | 193.0841 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6482.5409 | -36.1058 | 9.97 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5849.1277 | 109.3439 | 9.31 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5927.0671 | -311.0438 | 10.27 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6560.4804 | 250.7767 | 10.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.51 | 202] 1.5 [DL + RSX] | 6828.6881 | -168.2107 | -185.5717 |
| Bottom | 1.55 | 202] 1.5 [DL + RSX] | 6906.6276 | 174.0164 | 246.1108 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5570.1408 | 107.9331 | 185.9127 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5648.0803 | 610.2242 | 186.8662 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6828.6881 | -37.0814 | 10.5 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6166.1683 | 107.9331 | 9.79 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6244.1078 | -345.5567 | 10.89 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6906.6276 | 246.1108 | 11.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.537 | 202] 1.5 [DL + RSX] | 7172.8375 | -154.7828 | -168.0727 |
| Bottom | 1.573 | 202] 1.5 [DL + RSX] | 7250.777 | 161.8668 | 245.8455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5858.5767 | 122.3111 | 177.7341 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5936.5162 | 640.6254 | 178.6972 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7172.8375 | -38.5479 | 11.03 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6481.4931 | 122.3111 | 10.33 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6559.4326 | -391.8879 | 11.56 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7250.777 | 245.8455 | 12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.559 | 202] 1.5 [DL + RSX] | 7514.6918 | -139.1004 | -150.5147 |
| Bottom | 1.602 | 202] 1.5 [DL + RSX] | 7592.6313 | 147.7134 | 251.3121 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6150.0689 | 161.5253 | 168.2141 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6228.0084 | 682.3691 | 169.1043 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7514.6918 | -40.3327 | 11.55 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6795.3472 | 161.5253 | 10.96 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7592.6313 | -22.4181 | 11.6 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7592.6313 | 251.3121 | 12.54 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.576 | 202] 1.5 [DL + RSX] | 7853.558 | -120.7318 | -143.8272 |
| Bottom | 1.628 | 202] 1.5 [DL + RSX] | 7931.4975 | 131.476 | 267.6257 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6444.7653 | 231.6033 | 157.2378 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6522.7048 | 736.8418 | 157.9799 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7853.558 | -33.0368 | 12.04 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7107.8467 | 231.6033 | 11.73 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7931.4975 | -58.8552 | 12.26 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7931.4975 | 267.6257 | 13.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.59 | 202] 1.5 [DL + RSX] | 8189.8439 | -98.3922 | -163.6824 |
| Bottom | 1.655 | 202] 1.5 [DL + RSX] | 8270.2576 | 114.8298 | 292.6188 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6742.8042 | 328.1166 | 139.7506 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6823.218 | 799.4292 | 140.3145 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8189.8439 | -0.6418 | 12.41 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7420.3281 | 328.1166 | 12.6 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8270.2576 | -103.0006 | 12.96 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7500.7418 | 799.4292 | 14.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.121 | 202] 1.5 [DL + RSX] | 8520.1562 | 312.4781 | -193.8473 |
| Bottom | 2.2 | 202] 1.5 [DL + RSX] | 8624.0756 | 315.5333 | 492.0705 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7043.6253 | 459.6621 | 140.5248 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7147.5446 | 1069.1663 | 140.9035 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7732.3438 | -591.1452 | 14.16 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8520.1562 | 62.3642 | 13.17 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8624.0756 | -111.9459 | 13.53 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8624.0756 | 492.0705 | 15.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P16 | 18765 | 10905 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 9805 | 18765 | 12005 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.121 | 202] 1.5 [DL + RSX] | 8951.6518 | 277.8254 | -393.6677 |
| Bottom | 2.157 | 202] 1.5 [DL + RSX] | 9051.1174 | 280.5044 | 465.6421 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7461.8998 | 607.4794 | 150.2194 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7561.3654 | 1213.4389 | 150.2851 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8951.6518 | -393.6677 | 15.19 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8951.6518 | 109.0528 | 14.01 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9051.1174 | -422.8689 | 15.46 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9051.1174 | 465.6421 | 15.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.819 | 203] 1.5 [DL + RSY] | 1815.53 | -349.44 | 256.0682 |
| Bottom | 1.247 | 207] [0.9 DL + 1.5 RSY] | 1093.4209 | 236.0039 | -31.6028 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1856.4056 | 356.5096 | -139.6731 | 200.6263 | 663.9829 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1932.2195 | 120.8684 | -139.7558 | 202.737 | 666.0935 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 1981.5815 | 356.5096 | 5.16 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2098.271 | -33.6534 | 3.46 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2098.271 | 23.4005 | 3.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.917 | 203] 1.5 [DL + RSY] | 2190.8533 | -267.3212 | 97.3423 |
| Bottom | 0.923 | 203] 1.5 [DL + RSY] | 2266.6672 | 274.2776 | -72.6755 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2168.1982 | 218.1113 | -85.6916 | 209.3066 | 672.6632 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2244.0121 | 98.6915 | -86.3395 | 211.4173 | 674.7738 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2381.8233 | -86.2148 | 4.21 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2381.8233 | 218.1113 | 4.98 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2457.6371 | -189.5565 | 4.93 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2457.6371 | 98.6915 | 4.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.931 | 203] 1.5 [DL + RSY] | 2700.3563 | -282.2682 | 54.9654 |
| Bottom | 0.925 | 203] 1.5 [DL + RSY] | 2776.1701 | 277.0377 | -66.3335 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2473.9649 | 199.6571 | -71.4354 | 217.8192 | 681.1757 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2549.7787 | 109.9974 | -72.2419 | 219.9298 | 683.2864 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2782.5367 | -150.2036 | 5.21 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2782.5367 | 199.6571 | 5.5 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2858.3506 | -188.5267 | 5.55 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2858.3506 | 109.9974 | 5.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.934 | 203] 1.5 [DL + RSY] | 3044.56 | -276.2413 | 58.1707 |
| Bottom | 0.932 | 203] 1.5 [DL + RSY] | 3120.3739 | 273.5902 | -61.6531 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2776.2107 | 207.2071 | -70.6844 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2852.0246 | 117.2251 | -71.4376 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3180.3828 | -150.318 | 5.83 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3180.3828 | 207.2071 | 6.16 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3256.1966 | -187.3782 | 6.16 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3256.1966 | 117.2251 | 5.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.95 | 203] 1.5 [DL + RSY] | 3391.9357 | -274.3326 | 60.376 |
| Bottom | 0.952 | 203] 1.5 [DL + RSY] | 3467.7495 | 271.449 | -60.6467 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3075.8396 | 210.0499 | -70.3881 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3151.6534 | 121.3317 | -71.055 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3574.6997 | -148.2303 | 6.43 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3574.6997 | 210.0499 | 6.79 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3650.5136 | -189.9302 | 6.79 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3650.5136 | 121.3317 | 6.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.979 | 203] 1.5 [DL + RSY] | 3741.2671 | -271.5309 | 59.4643 |
| Bottom | 0.982 | 203] 1.5 [DL + RSY] | 3817.081 | 269.0766 | -60.2345 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3373.2824 | 208.7962 | -69.2176 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3449.0962 | 125.2747 | -69.8124 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3965.2388 | -148.1535 | 7.04 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3965.2388 | 208.7962 | 7.39 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4041.0527 | -193.1812 | 7.42 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4041.0527 | 125.2747 | 7.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.989 | 203] 1.5 [DL + RSY] | 4090.9556 | -268.6324 | 58.3134 |
| Bottom | 0.993 | 203] 1.5 [DL + RSY] | 4166.7695 | 266.6632 | -59.8324 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3668.7552 | 206.1484 | -67.8853 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3744.5691 | 129.3178 | -68.4368 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4351.7783 | -147.0323 | 7.63 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4351.7783 | 206.1484 | 7.98 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4427.5922 | -196.434 | 8.04 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4427.5922 | 129.3178 | 7.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.017 | 203] 1.5 [DL + RSY] | 4439.7142 | -265.2413 | 57.3964 |
| Bottom | 1.023 | 203] 1.5 [DL + RSY] | 4515.5281 | 263.9963 | -59.5186 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3962.4228 | 202.2401 | -66.5508 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4038.2366 | 133.0335 | -67.0935 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4734.11 | -144.1069 | 8.21 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4734.11 | 202.2401 | 8.55 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4809.9238 | -199.542 | 8.65 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4809.9238 | 133.0335 | 8.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.053 | 203] 1.5 [DL + RSY] | 4786.632 | -261.1866 | 56.525 |
| Bottom | 1.063 | 203] 1.5 [DL + RSY] | 4862.4459 | 260.7154 | -61.6849 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4254.4193 | 196.515 | -66.0597 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4330.2331 | 134.168 | -66.6174 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5112.0042 | -139.1319 | 8.77 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5112.0042 | 196.515 | 9.11 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5187.818 | -205.0223 | 9.27 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5187.818 | 134.168 | 8.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.089 | 203] 1.5 [DL + RSY] | 5130.9857 | -256.5983 | 53.1002 |
| Bottom | 1.103 | 203] 1.5 [DL + RSY] | 5206.7996 | 256.8243 | -74.7308 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4544.8549 | 185.9856 | -69.1348 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4620.6688 | 126.9254 | -69.7023 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5485.1887 | -134.0724 | 9.32 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5485.1887 | 185.9856 | 9.63 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5561.0026 | -223.9065 | 9.97 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5561.0026 | 126.9254 | 9.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.122 | 203] 1.5 [DL + RSY] | 5472.2282 | -251.5734 | 38.4388 |
| Bottom | 1.142 | 203] 1.5 [DL + RSY] | 5548.042 | 253.6886 | -73.55 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4833.8104 | 161.3642 | -67.3039 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4909.6242 | 147.7537 | -67.8019 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5853.3667 | -137.153 | 9.92 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5853.3667 | 161.3642 | 10.06 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5929.1806 | -242.7092 | 10.65 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5929.1806 | 147.7537 | 10.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P17 | 4242.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5045 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.149 | 203] 1.5 [DL + RSY] | 5807.76 | -241.7768 | 36.1205 |
| Bottom | 1.209 | 203] 1.5 [DL + RSY] | 5883.5739 | 242.67 | 330.4371 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5120.3229 | 151.8391 | 128.9259 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5196.1368 | 510.6053 | 128.9169 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6214.3811 | -129.2728 | 10.43 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6214.3811 | 151.8391 | 10.56 | 5 |
| Bottom–Left | Leg 1 | 400 | 206] [0.9 DL + 1.5 RSX] | 3992.9286 | -12.3761 | 6.29 | 5 |
| Botttom–Right | Leg 1 | 400 | 206] [0.9 DL + 1.5 RSX] | 6290.195 | 510.6053 | 12.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.161 | 203] 1.5 [DL + RSY] | 6164.7343 | -288.1099 | -811.1214 |
| Bottom | 1.069 | 203] 1.5 [DL + RSY] | 6259.2064 | 286.1058 | -108.2348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5415.3775 | -576.9906 | 269.2425 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5509.8496 | 264.8521 | 268.9268 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6578.8826 | -987.6634 | 11.93 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6673.3547 | -410.1911 | 9.88 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6673.3547 | 264.8521 | 9.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.066 | 203] 1.5 [DL + RSY] | 6548.1369 | -263.4079 | -83.8195 |
| Bottom | 1.086 | 203] 1.5 [DL + RSY] | 6642.609 | 274.3434 | 49.6122 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5703.9414 | 186.2736 | 73.1493 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5798.4135 | 371.8386 | 73.3053 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6965.9964 | -286.2515 | 9.78 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6965.9964 | 186.2736 | 9.41 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7060.4685 | -337.2188 | 10.09 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7060.4685 | 371.8386 | 10.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.1 | 203] 1.5 [DL + RSY] | 6933.178 | -259.2127 | 76.7441 |
| Bottom | 1.119 | 203] 1.5 [DL + RSY] | 7027.6501 | 269.187 | -39.6636 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5993.9476 | 297.4014 | -71.765 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6088.4197 | 375.6424 | -72.0571 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7350.615 | -213.0461 | 9.99 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7350.615 | 297.4014 | 10.3 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7445.0871 | -389.9501 | 10.77 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7445.0871 | 375.6424 | 10.72 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.132 | 203] 1.5 [DL + RSY] | 7318.0717 | -247.7794 | 53.1614 |
| Bottom | 1.157 | 203] 1.5 [DL + RSY] | 7412.5438 | 260.7008 | -51.0675 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6285.1397 | 295.5215 | -67.8031 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6379.6118 | 393.8826 | -68.2554 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7732.3265 | -254.1883 | 10.62 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7732.3265 | 295.5215 | 10.77 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7826.7986 | -431.7998 | 11.4 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7412.5438 | 13.1504 | 9.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.168 | 202] 1.5 [DL + RSX] | 8110.416 | -166.3605 | 308.6236 |
| Bottom | 1.193 | 203] 1.5 [DL + RSY] | 7796.3266 | 251.6883 | -53.7412 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6577.2826 | 308.6236 | -64.8655 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6671.7547 | 422.8953 | -65.5734 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8110.416 | -285.7683 | 11.21 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8110.416 | 308.6236 | 11.3 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8204.8881 | -467.3751 | 12.01 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8204.8881 | 422.8953 | 11.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.211 | 202] 1.5 [DL + RSX] | 8484.5548 | -160.013 | 334.754 |
| Bottom | 1.233 | 202] 1.5 [DL + RSX] | 8579.0269 | 163.2686 | -507.4705 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6870.4211 | 334.754 | -65.1758 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6964.8932 | 457.745 | -66.1713 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8484.5548 | -313.3744 | 11.78 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8484.5548 | 334.754 | 11.86 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8579.0269 | -507.4705 | 12.63 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8579.0269 | 457.745 | 12.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.252 | 202] 1.5 [DL + RSX] | 8854.3489 | -152.1268 | 370.1832 |
| Bottom | 1.276 | 202] 1.5 [DL + RSX] | 8948.821 | 157.8144 | -552.3696 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7164.6373 | 370.1832 | -64.8915 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7259.1094 | 505.6862 | -66.0861 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8854.3489 | -348.7087 | 12.38 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8854.3489 | 370.1832 | 12.46 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8948.821 | -552.3696 | 13.26 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8948.821 | 505.6862 | 13.08 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.292 | 202] 1.5 [DL + RSX] | 9219.3324 | -141.4142 | 424.0667 |
| Bottom | 1.317 | 202] 1.5 [DL + RSX] | 9313.8045 | 149.6028 | -591.8554 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7460.1635 | 424.0667 | -60.295 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7554.6356 | 586.1987 | -61.4992 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9219.3324 | -393.8262 | 13 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9219.3324 | 424.0667 | 13.11 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9313.8045 | -591.8554 | 13.86 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9313.8045 | 586.1987 | 13.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.332 | 202] 1.5 [DL + RSX] | 9579.2959 | -129.531 | 516.0056 |
| Bottom | 1.371 | 202] 1.5 [DL + RSX] | 9676.7671 | 156.3309 | 706.7031 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7757.0905 | 516.0056 | -62.2376 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7854.5617 | 706.7031 | -63.2244 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9579.2959 | -437.6428 | 13.62 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9579.2959 | 516.0056 | 13.91 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9676.7671 | -654.7851 | 14.55 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9676.7671 | 706.7031 | 14.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.343 | 202] 1.5 [DL + RSX] | 9997.2911 | -99.4189 | -637.1937 |
| Bottom | 1.384 | 202] 1.5 [DL + RSX] | 10123.2539 | 120.8098 | 1120.9574 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8143.3098 | 422.4989 | 164.774 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8269.2726 | 1120.9574 | 165.4815 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9997.2911 | -637.1937 | 14.89 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9997.2911 | 422.4989 | 14.08 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10123.2539 | -1026.3382 | 16.5 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10123.2539 | 1120.9574 | 16.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P17 | 4440 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 14300 | 5440 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.377 | 202] 1.5 [DL + RSX] | 10414.6024 | -46.1782 | -1025.3281 |
| Bottom | 1.512 | 202] 1.5 [DL + RSX] | 10535.1668 | 67.3957 | 1938.429 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8527.5486 | 931.8947 | 249.8451 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8648.113 | 1938.429 | 249.9693 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10414.6024 | -1025.3281 | 16.86 | 5 |
| Top–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10414.6024 | 931.8947 | 16.51 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10535.1668 | -1891.047 | 20.26 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10535.1668 | 1938.429 | 20.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.683 | 207] [0.9 DL + 1.5 RSY] | 1005.4407 | -258.7065 | -147.8717 |
| Bottom | 1.183 | 207] [0.9 DL + 1.5 RSY] | 1050.929 | 224.6879 | -37.6199 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1789.3218 | -93.0475 | 126.8997 | 198.7587 | 662.1152 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1865.1357 | 115.4309 | 126.9811 | 200.8694 | 664.2259 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1946.0996 | -191.1675 | 4.14 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2021.9135 | -41.5764 | 3.39 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2021.9135 | 21.7937 | 3.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.863 | 203] 1.5 [DL + RSY] | 2104.2397 | -253.473 | -88.5622 |
| Bottom | 0.862 | 203] 1.5 [DL + RSY] | 2180.0535 | 259.1733 | 61.8613 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2089.9579 | 92.339 | 79.2266 | 207.1284 | 670.4849 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2165.7718 | 174.7806 | 79.88 | 209.2391 | 672.5956 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2284.8723 | -211.3468 | 4.79 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2284.8723 | 92.339 | 4.1 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2360.6861 | -112.3371 | 4.33 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2360.6861 | 174.7806 | 4.69 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.885 | 203] 1.5 [DL + RSY] | 2600.5159 | -268.2955 | -46.4194 |
| Bottom | 0.878 | 203] 1.5 [DL + RSY] | 2676.3298 | 263.0464 | 56.9649 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2384.8078 | 155.7503 | 65.7501 | 215.337 | 678.6936 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2460.6217 | 175.1634 | 66.5625 | 217.4477 | 680.8042 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2671.9494 | -193.706 | 5.29 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2671.9494 | 155.7503 | 5.07 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2747.7633 | -122.4051 | 4.99 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2747.7633 | 175.1634 | 5.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.893 | 203] 1.5 [DL + RSY] | 2934.6397 | -264.1897 | -50.0505 |
| Bottom | 0.89 | 203] 1.5 [DL + RSY] | 3010.4536 | 261.319 | 52.7593 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2677.4575 | 155.3029 | 65.4645 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2753.2714 | 174.6139 | 66.2232 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3057.9425 | -201.8959 | 5.94 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3057.9425 | 155.3029 | 5.67 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3133.7564 | -129.1385 | 5.63 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3133.7564 | 174.6139 | 5.9 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.913 | 203] 1.5 [DL + RSY] | 3272.6982 | -263.5651 | -53.3471 |
| Bottom | 0.914 | 203] 1.5 [DL + RSY] | 3348.5121 | 260.6049 | 51.9605 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2968.654 | 152.1265 | 65.7337 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3044.4679 | 177.6505 | 66.4054 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3441.8087 | -205.8274 | 6.56 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3441.8087 | 152.1265 | 6.25 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3517.6226 | -132.8404 | 6.25 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3517.6226 | 177.6505 | 6.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.944 | 203] 1.5 [DL + RSY] | 3613.4491 | -262.0151 | -53.674 |
| Bottom | 0.946 | 203] 1.5 [DL + RSY] | 3689.263 | 259.5642 | 51.528 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3258.7436 | 150.9791 | 65.0905 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3334.5574 | 181.2967 | 65.6894 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3823.1571 | -205.6557 | 7.15 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3823.1571 | 150.9791 | 6.83 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3898.971 | -136.4654 | 6.87 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3898.971 | 181.2967 | 7.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.957 | 203] 1.5 [DL + RSY] | 3955.3785 | -260.2242 | -53.8562 |
| Bottom | 0.96 | 203] 1.5 [DL + RSY] | 4031.1924 | 258.3508 | 50.9188 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3547.8303 | 148.831 | 64.2325 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3623.6442 | 184.8446 | 64.7876 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4201.6296 | -204.0544 | 7.73 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4201.6296 | 148.831 | 7.41 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4277.4435 | -140.2804 | 7.48 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4277.4435 | 184.8446 | 7.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.986 | 203] 1.5 [DL + RSY] | 4297.2306 | -257.8411 | -54.3274 |
| Bottom | 0.991 | 203] 1.5 [DL + RSY] | 4373.0445 | 256.7598 | 50.2986 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3835.9669 | 144.9043 | 63.3296 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3911.7807 | 188.1609 | 63.8753 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4576.8969 | -201.1739 | 8.3 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4576.8969 | 144.9043 | 7.97 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4652.7108 | -143.8382 | 8.08 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4652.7108 | 188.1609 | 8.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.023 | 203] 1.5 [DL + RSY] | 4638.0382 | -254.7326 | -54.8148 |
| Bottom | 1.032 | 203] 1.5 [DL + RSY] | 4713.8521 | 254.4501 | 52.1637 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4123.1771 | 138.9657 | 63.2318 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4198.9909 | 193.7805 | 63.792 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4948.6205 | -196.4523 | 8.85 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4948.6205 | 138.9657 | 8.52 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5024.4343 | -144.8537 | 8.67 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5024.4343 | 193.7805 | 8.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.06 | 203] 1.5 [DL + RSY] | 4976.9543 | -251.0865 | -52.6169 |
| Bottom | 1.073 | 203] 1.5 [DL + RSY] | 5052.7681 | 251.4935 | 64.7398 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4409.4437 | 133.0175 | 66.5954 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4485.2576 | 212.5553 | 67.1651 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5316.4053 | -186.8686 | 9.37 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5316.4053 | 133.0175 | 9.06 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5392.2192 | -137.6974 | 9.2 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5392.2192 | 212.5553 | 9.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.095 | 203] 1.5 [DL + RSY] | 5313.337 | -246.9494 | -39.2851 |
| Bottom | 1.112 | 203] 1.5 [DL + RSY] | 5389.1508 | 249.1371 | 62.0653 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4694.7628 | 135.0726 | 64.7927 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4770.5767 | 230.2321 | 65.2927 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5679.8944 | -163.3707 | 9.8 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5679.8944 | 135.0726 | 9.63 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5755.7083 | -159.8985 | 9.9 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5755.7083 | 230.2321 | 10.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P18 | 23097.5 | 14300 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 14300 | 23900 | 14300 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.123 | 203] 1.5 [DL + RSY] | 5644.4541 | -238.3796 | -39.2356 |
| Bottom | 1.182 | 203] 1.5 [DL + RSY] | 5720.268 | 239.0627 | -335.3623 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4978.034 | 125.1089 | -128.6667 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5053.8478 | -115.1526 | -128.6635 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6036.8233 | -155.9984 | 10.31 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6036.8233 | 125.1089 | 10.13 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6112.6372 | -115.1526 | 10.19 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3879.3402 | 10.7656 | 6.11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.136 | 203] 1.5 [DL + RSY] | 5997.1176 | -285.4238 | 779.7258 |
| Bottom | 1.046 | 203] 1.5 [DL + RSY] | 6091.5897 | 284.0715 | 95.1165 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5271.7164 | 957.1407 | -264.0513 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5366.1885 | 395.4775 | -263.7365 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6397.5134 | 957.1407 | 11.59 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6491.9855 | -277.6018 | 9.16 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6491.9855 | 395.4775 | 9.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.041 | 203] 1.5 [DL + RSY] | 6376.6937 | -260.0594 | 74.1622 |
| Bottom | 1.066 | 203] 1.5 [DL + RSY] | 6471.1658 | 271.7359 | -62.6208 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5559.8479 | 278.9086 | -73.818 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5654.32 | 324.2076 | -73.9713 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6781.5406 | -194.236 | 9.21 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6781.5406 | 278.9086 | 9.52 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6876.0127 | -383.1736 | 10.03 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6876.0127 | 324.2076 | 9.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.079 | 203] 1.5 [DL + RSY] | 6758.8882 | -256.657 | -81.7783 |
| Bottom | 1.096 | 203] 1.5 [DL + RSY] | 6853.3603 | 266.9791 | -38.3701 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5850.056 | 206.3465 | 69.9159 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5944.5281 | 376.2232 | 70.2075 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7163.9681 | -304.9689 | 10.1 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7163.9681 | 206.3465 | 9.73 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7258.4402 | -387.453 | 10.53 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7258.4402 | 376.2232 | 10.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.11 | 203] 1.5 [DL + RSY] | 7141.4379 | -245.866 | -59.9816 |
| Bottom | 1.133 | 203] 1.5 [DL + RSY] | 7235.91 | 259.0249 | 38.0603 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6141.6062 | 246.2733 | 66.515 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6236.0783 | 418.4059 | 66.9675 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7543.7953 | -304.4179 | 10.57 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7543.7953 | 246.2733 | 10.35 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7638.2674 | -405.3799 | 11.07 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7638.2674 | 418.4059 | 11.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.143 | 203] 1.5 [DL + RSY] | 7523.4709 | -234.8506 | -50.5184 |
| Bottom | 1.169 | 203] 1.5 [DL + RSY] | 7617.943 | 250.5518 | 40.1352 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6434.3703 | 277.5261 | 63.8449 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6528.8424 | 454.4153 | 64.5535 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7920.4337 | -318.0477 | 11.09 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7920.4337 | 277.5261 | 10.94 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8014.9058 | -434.0161 | 11.65 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8014.9058 | 454.4153 | 11.72 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.185 | 202] 1.5 [DL + RSX] | 8293.5233 | -157.4046 | -344.5911 |
| Bottom | 1.206 | 202] 1.5 [DL + RSX] | 8387.9954 | 160.8523 | 495.0686 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6728.3577 | 304.9053 | 64.4179 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6822.8298 | 495.0686 | 65.4147 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8293.5233 | -344.5911 | 11.66 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8293.5233 | 304.9053 | 11.51 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8387.9954 | -468.3858 | 12.24 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8387.9954 | 495.0686 | 12.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.227 | 202] 1.5 [DL + RSX] | 8662.6374 | -150.1911 | -380.2531 |
| Bottom | 1.25 | 202] 1.5 [DL + RSX] | 8757.1095 | 156.3119 | 540.7449 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7023.5985 | 340.1428 | 64.4108 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7118.0706 | 540.7449 | 65.6071 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8662.6374 | -380.2531 | 12.25 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8662.6374 | 340.1428 | 12.1 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8757.1095 | -515.6996 | 12.88 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8757.1095 | 540.7449 | 12.97 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.267 | 202] 1.5 [DL + RSX] | 9027.3764 | -139.344 | -434.2073 |
| Bottom | 1.29 | 202] 1.5 [DL + RSX] | 9121.8485 | 146.0882 | -600.2259 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7320.3784 | 385.2776 | 58.4816 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7414.8505 | 576.1785 | 59.6883 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9027.3764 | -434.2073 | 12.91 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9027.3764 | 385.2776 | 12.73 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9121.8485 | -600.2259 | 13.65 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9121.8485 | 576.1785 | 13.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.31 | 202] 1.5 [DL + RSX] | 9387.0145 | -132.0164 | -530.3906 |
| Bottom | 1.355 | 202] 1.5 [DL + RSX] | 9484.4857 | 165.6685 | -751.0879 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7618.1449 | 424.6721 | -63.7672 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7715.6161 | 607.9739 | -64.7569 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9387.0145 | -530.3906 | 13.72 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9387.0145 | 424.6721 | 13.33 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9484.4857 | -751.0879 | 14.67 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9484.4857 | 607.9739 | 14.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.329 | 202] 1.5 [DL + RSX] | 9858.1312 | -102.9414 | 658.6084 |
| Bottom | 1.363 | 202] 1.5 [DL + RSX] | 9984.094 | 115.9215 | -1132.7455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8058.4639 | 658.6084 | -172.5442 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8184.4267 | 1017.9613 | -173.2503 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9858.1312 | -401.7335 | 13.83 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9858.1312 | 658.6084 | 14.79 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 9984.094 | -1132.7455 | 16.73 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 9984.094 | 1017.9613 | 16.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P18 | 22900 | 14300 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 14300 | 23900 | 14300 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.354 | 202] 1.5 [DL + RSX] | 10264.825 | -38.4356 | 1008.8002 |
| Bottom | 1.495 | 202] 1.5 [DL + RSX] | 10385.3894 | 61.9406 | -1948.9711 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8442.407 | 1008.8002 | -249.7716 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8562.9714 | 1882.5909 | -249.8954 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10264.825 | -942.8865 | 16.37 | 5 |
| Top–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10264.825 | 1008.8002 | 16.61 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10385.3894 | -1948.9711 | 20.29 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10385.3894 | 1882.5909 | 20.04 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.412 | 207] [0.9 DL + 1.5 RSY] | 1018.0074 | 237.1 | 150.46 |
| Bottom | 0.97 | 207] [0.9 DL + 1.5 RSY] | 1063.4957 | -203.9287 | -24.6888 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1753.239 | 347.9411 | -138.6204 | 197.7542 | 661.1107 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1829.0529 | 123.4548 | -138.6414 | 199.8648 | 663.2214 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 1910.4402 | 347.9411 | 5 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1988.7499 | -28.2395 | 3.26 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1988.7499 | 10.4861 | 3.16 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.756 | 203] 1.5 [DL + RSY] | 2259.1943 | 222.8559 | 86.8169 |
| Bottom | 0.764 | 203] 1.5 [DL + RSY] | 2335.0082 | -226.9792 | -65.2033 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2067.4395 | 225.0198 | -84.0745 | 206.5015 | 669.858 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2143.2534 | 99.6008 | -84.8153 | 208.6122 | 671.9687 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2314.8217 | -88.5197 | 4.12 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2314.8217 | 225.0198 | 4.92 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2390.6355 | -193.2058 | 4.85 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2390.6355 | 99.6008 | 4.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.805 | 203] 1.5 [DL + RSY] | 2611.253 | 239.0067 | 45.0936 |
| Bottom | 0.796 | 203] 1.5 [DL + RSY] | 2687.0669 | -232.3598 | -59.612 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2376.4205 | 206.7543 | -70.7447 | 215.1035 | 678.4601 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2452.2344 | 108.0159 | -71.6166 | 217.2142 | 680.5707 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2716.9042 | -150.3017 | 5.11 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2716.9042 | 206.7543 | 5.44 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2792.7181 | -190.554 | 5.46 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2792.7181 | 108.0159 | 4.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.822 | 203] 1.5 [DL + RSY] | 2967.0082 | 236.5322 | 47.2128 |
| Bottom | 0.823 | 203] 1.5 [DL + RSY] | 3042.822 | -232.3383 | -55.2687 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2682.6764 | 213.0812 | -70.3088 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2758.4902 | 115.1367 | -71.0985 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3115.6071 | -150.78 | 5.73 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3115.6071 | 213.0812 | 6.09 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3191.421 | -189.4579 | 6.07 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3191.421 | 115.1367 | 5.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.86 | 203] 1.5 [DL + RSY] | 3324.0112 | 237.3299 | 48.7929 |
| Bottom | 0.86 | 203] 1.5 [DL + RSY] | 3399.8251 | -233.1746 | -54.2325 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2986.3878 | 215.0001 | -69.7774 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3062.2016 | 119.6345 | -70.4711 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3510.3957 | -148.7924 | 6.33 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3510.3957 | 215.0001 | 6.72 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3586.2096 | -192.0922 | 6.7 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3586.2096 | 119.6345 | 6.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.896 | 203] 1.5 [DL + RSY] | 3680.3155 | 237.1975 | 48.036 |
| Bottom | 0.897 | 203] 1.5 [DL + RSY] | 3756.1293 | -233.6069 | -53.7525 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3287.9226 | 213.2542 | -68.3682 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3363.7364 | 124.121 | -68.982 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3901.1589 | -148.6626 | 6.94 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3901.1589 | 213.2542 | 7.32 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3976.9728 | -195.5314 | 7.33 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3976.9728 | 124.121 | 6.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.915 | 203] 1.5 [DL + RSY] | 4034.8157 | 236.8265 | 47.4107 |
| Bottom | 0.921 | 203] 1.5 [DL + RSY] | 4110.6296 | -233.8197 | -53.3414 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3587.4313 | 210.3779 | -66.8433 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3663.2452 | 128.7551 | -67.4083 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4287.7263 | -147.6755 | 7.54 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4287.7263 | 210.3779 | 7.9 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4363.5402 | -199.0084 | 7.96 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4363.5402 | 128.7551 | 7.55 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.959 | 203] 1.5 [DL + RSY] | 4387.0107 | 235.8912 | 47.2028 |
| Bottom | 0.966 | 203] 1.5 [DL + RSY] | 4462.8246 | -233.646 | -53.0114 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3885.0282 | 206.3102 | -65.3511 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3960.842 | 133.0009 | -65.9037 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4669.9319 | -144.9125 | 8.12 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4669.9319 | 206.3102 | 8.48 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4745.7458 | -202.2243 | 8.57 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4745.7458 | 133.0009 | 8.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.001 | 203] 1.5 [DL + RSY] | 4736.6069 | 234.2686 | 47.1848 |
| Bottom | 1.01 | 203] 1.5 [DL + RSY] | 4812.4208 | -232.8003 | -55.0526 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4180.7869 | 200.3749 | -64.835 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4256.6007 | 134.6449 | -65.3992 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5047.5724 | -139.9979 | 8.68 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5047.5724 | 200.3749 | 9.03 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5123.3862 | -207.9195 | 9.19 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5123.3862 | 134.6449 | 8.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.042 | 203] 1.5 [DL + RSY] | 5083.2897 | 232.0749 | 44.7963 |
| Bottom | 1.054 | 203] 1.5 [DL + RSY] | 5159.1036 | -231.2731 | -67.7699 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4474.7508 | 189.4582 | -68.1325 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4550.5647 | 128.5073 | -68.7038 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5420.3978 | -134.9717 | 9.23 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5420.3978 | 189.4582 | 9.55 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5496.2116 | -227.4285 | 9.89 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5496.2116 | 128.5073 | 9.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.079 | 203] 1.5 [DL + RSY] | 5426.7513 | 229.4653 | 31.4209 |
| Bottom | 1.097 | 203] 1.5 [DL + RSY] | 5502.5651 | -230.4124 | -66.7263 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4766.9413 | 164.1643 | -65.8213 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4842.7552 | 150.7088 | -66.3166 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5788.1039 | -137.6503 | 9.82 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5788.1039 | 164.1643 | 9.97 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5863.9178 | -245.572 | 10.56 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5863.9178 | 150.7088 | 10.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P19 | 4242.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5045 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.112 | 203] 1.5 [DL + RSY] | 5764.5466 | 222.3385 | 30.0005 |
| Bottom | 1.171 | 203] 1.5 [DL + RSY] | 5840.3604 | -222.2984 | 329.3256 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5056.2246 | 155.2307 | 124.3997 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5132.0384 | 509.8059 | 124.2437 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6148.7537 | -129.0508 | 10.33 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6148.7537 | 155.2307 | 10.48 | 5 |
| Bottom–Left | Leg 1 | 400 | 206] [0.9 DL + 1.5 RSX] | 3953.2464 | -16.403 | 6.25 | 5 |
| Botttom–Right | Leg 1 | 400 | 206] [0.9 DL + 1.5 RSX] | 6224.5676 | 509.8059 | 12.66 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.115 | 203] 1.5 [DL + RSY] | 6128.9237 | 265.6784 | -790.4035 |
| Bottom | 1.034 | 203] 1.5 [DL + RSY] | 6223.3958 | -263.1867 | -107.5254 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5360.7426 | -562.9466 | 262.0986 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5455.2147 | 265.6579 | 261.5186 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6511.8535 | -974.461 | 11.79 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6606.3256 | -420.7237 | 9.84 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6606.3256 | 265.6579 | 9.25 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.035 | 203] 1.5 [DL + RSY] | 6520.877 | 244.277 | -73.3245 |
| Bottom | 1.054 | 203] 1.5 [DL + RSY] | 6615.3491 | -254.0971 | 40.0778 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5664.8549 | 194.8579 | 67.292 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5759.327 | 372.5521 | 67.3841 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6897.0799 | -294.4805 | 9.73 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6897.0799 | 194.8579 | 9.35 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6991.552 | -344.973 | 10.03 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6991.552 | 372.5521 | 10.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.079 | 203] 1.5 [DL + RSY] | 6913.3363 | 241.7715 | 69.3611 |
| Bottom | 1.097 | 203] 1.5 [DL + RSY] | 7007.8084 | -250.7314 | -35.3508 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5968.6246 | 305.5262 | -67.7708 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6063.0967 | 375.0182 | -68.0265 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7279.3845 | -219.7733 | 9.92 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7279.3845 | 305.5262 | 10.24 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7373.8566 | -392.9995 | 10.69 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7373.8566 | 375.0182 | 10.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.114 | 203] 1.5 [DL + RSY] | 7305.092 | 232.7139 | 48.6267 |
| Bottom | 1.138 | 203] 1.5 [DL + RSY] | 7399.5641 | -244.4466 | -46.8678 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6272.5105 | 303.2507 | -64.6246 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6366.9826 | 391.9981 | -65.0498 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7658.3707 | -258.2985 | 10.54 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7658.3707 | 303.2507 | 10.71 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7752.8428 | -433.2059 | 11.32 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7399.5641 | 5.6599 | 9.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.15 | 203] 1.5 [DL + RSY] | 7695.24 | 223.2374 | 39.0011 |
| Bottom | 1.177 | 203] 1.5 [DL + RSY] | 7789.7121 | -237.5147 | -49.5015 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6576.4065 | 315.7692 | -61.8174 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6670.8786 | 420.3953 | -62.5233 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8033.2875 | -289.9833 | 11.13 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8033.2875 | 315.7692 | 11.23 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8127.7596 | -468.0081 | 11.91 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8127.7596 | 420.3953 | 11.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.192 | 202] 1.5 [DL + RSX] | 8403.8601 | 149.1426 | 342.1117 |
| Bottom | 1.214 | 203] 1.5 [DL + RSY] | 8177.6445 | -228.6621 | -50.6299 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6880.4781 | 342.1117 | -62.2288 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6974.9502 | 455.6733 | -63.2459 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8403.8601 | -318.6106 | 11.7 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8403.8601 | 342.1117 | 11.79 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8498.3322 | -508.1006 | 12.53 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8498.3322 | 455.6733 | 12.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.235 | 202] 1.5 [DL + RSX] | 8769.764 | 143.3121 | 378.8667 |
| Bottom | 1.257 | 202] 1.5 [DL + RSX] | 8864.2361 | -147.5121 | -553.5696 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7184.8532 | 378.8667 | -62.1045 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7279.3253 | 505.6769 | -63.3334 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8769.764 | -355.7465 | 12.3 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8769.764 | 378.8667 | 12.38 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8864.2361 | -553.5696 | 13.16 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8864.2361 | 505.6769 | 12.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.276 | 202] 1.5 [DL + RSX] | 9130.6436 | 134.8356 | 435.2399 |
| Bottom | 1.299 | 202] 1.5 [DL + RSX] | 9225.1157 | -141.84 | -593.6887 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7489.7157 | 435.2399 | -57.6925 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7584.1878 | 589.7802 | -58.9291 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9130.6436 | -402.7228 | 12.92 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9130.6436 | 435.2399 | 13.05 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9225.1157 | -593.6887 | 13.76 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9225.1157 | 589.7802 | 13.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.316 | 202] 1.5 [DL + RSX] | 9486.5076 | 124.1933 | 530.467 |
| Bottom | 1.352 | 202] 1.5 [DL + RSX] | 9583.9789 | -147.3634 | 707.8814 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7795.1532 | 530.467 | -61.8214 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7892.6244 | 707.8814 | -62.7971 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9486.5076 | -447.3348 | 13.54 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9486.5076 | 530.467 | 13.85 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9583.9789 | -665.2661 | 14.47 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9583.9789 | 707.8814 | 14.63 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.328 | 202] 1.5 [DL + RSX] | 9895.939 | 95.1594 | -651.4905 |
| Bottom | 1.369 | 202] 1.5 [DL + RSX] | 10021.9018 | -117.918 | 1141.6139 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8184.0742 | 437.2172 | 165.8172 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8310.037 | 1141.6139 | 166.5213 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9895.939 | -651.4905 | 14.81 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9895.939 | 437.2172 | 14.01 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10021.9018 | -1043.3703 | 16.44 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10021.9018 | 1141.6139 | 16.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P19 | 4440 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 3440 | 16230 | 5440 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.365 | 202] 1.5 [DL + RSX] | 10307.1267 | 46.3162 | -1031.9622 |
| Bottom | 1.502 | 202] 1.5 [DL + RSX] | 10427.6911 | -65.8969 | 1965.4744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8576.3255 | 940.3878 | 254.386 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8696.8899 | 1965.4744 | 254.5086 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10307.1267 | -1031.9622 | 16.75 | 5 |
| Top–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10307.1267 | 940.3878 | 16.41 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10427.6911 | -1923.4096 | 20.25 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10427.6911 | 1965.4744 | 20.41 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.338 | 207] [0.9 DL + 1.5 RSY] | 999.1501 | 228.7079 | -144.606 |
| Bottom | 0.916 | 207] [0.9 DL + 1.5 RSY] | 1044.6384 | -196.9441 | -15.9463 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1730.6559 | -93.3558 | 131.8704 | 197.1255 | 660.482 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 1806.4697 | 130.5531 | 131.8826 | 199.2361 | 662.5926 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1893.0205 | -199.3835 | 4.11 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1968.8343 | -16.3009 | 3.16 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1968.8343 | 14.5282 | 3.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.728 | 203] 1.5 [DL + RSY] | 2224.8379 | 213.6631 | -81.8272 |
| Bottom | 0.735 | 203] 1.5 [DL + RSY] | 2300.6518 | -218.5266 | 51.433 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2033.7538 | 91.7095 | 79.3427 | 205.5637 | 668.9202 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2109.5676 | 183.3503 | 80.0837 | 207.6744 | 671.0309 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2273.0937 | -219.7517 | 4.82 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2273.0937 | 91.7095 | 4.07 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2348.9076 | -108.1856 | 4.29 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2348.9076 | 183.3503 | 4.73 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.779 | 203] 1.5 [DL + RSY] | 2563.793 | 230.6169 | -42.0158 |
| Bottom | 0.766 | 203] 1.5 [DL + RSY] | 2639.6068 | -224.0095 | 46.1284 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2332.8448 | 152.634 | 66.7098 | 213.8904 | 677.2469 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2408.6586 | 181.2453 | 67.5857 | 216.0011 | 679.3576 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2661.0641 | -202.9712 | 5.33 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2661.0641 | 152.634 | 5.03 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 2736.878 | -116.3072 | 4.94 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 2736.878 | 181.2453 | 5.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.798 | 203] 1.5 [DL + RSY] | 2907.4216 | 228.252 | -45.0275 |
| Bottom | 0.796 | 203] 1.5 [DL + RSY] | 2983.2355 | -224.0553 | 41.981 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2629.9251 | 152.3469 | 66.6684 | 222.1611 | 685.5176 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2705.739 | 180.3216 | 67.4619 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3046.61 | -210.1411 | 5.97 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3046.61 | 152.3469 | 5.63 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3122.4238 | -123.3183 | 5.58 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3122.4238 | 180.3216 | 5.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.836 | 203] 1.5 [DL + RSY] | 3253.7606 | 229.312 | -47.6916 |
| Bottom | 0.833 | 203] 1.5 [DL + RSY] | 3329.5745 | -225.093 | 41.2786 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 2925.2841 | 149.291 | 66.6109 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3001.098 | 183.1182 | 67.3072 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3429.293 | -213.1596 | 6.58 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3429.293 | 149.291 | 6.21 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3505.1069 | -127.6967 | 6.2 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3505.1069 | 183.1182 | 6.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.871 | 203] 1.5 [DL + RSY] | 3600.9291 | 229.4089 | -47.874 |
| Bottom | 0.869 | 203] 1.5 [DL + RSY] | 3676.743 | -225.7963 | 41.2608 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3219.2764 | 148.1673 | 65.6492 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3295.0903 | 186.7394 | 66.2645 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3808.975 | -212.4514 | 7.17 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3808.975 | 148.1673 | 6.8 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3884.7889 | -132.0363 | 6.82 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3884.7889 | 186.7394 | 7.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.891 | 203] 1.5 [DL + RSY] | 3947.7831 | 229.2196 | -48.051 |
| Bottom | 0.895 | 203] 1.5 [DL + RSY] | 4023.597 | -226.3026 | 41.3538 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3512.0728 | 146.2468 | 64.5432 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3587.8867 | 190.4013 | 65.1091 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4185.5078 | -210.56 | 7.75 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4185.5078 | 146.2468 | 7.37 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4261.3217 | -136.4931 | 7.43 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4261.3217 | 190.4013 | 7.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.935 | 203] 1.5 [DL + RSY] | 4293.7509 | 228.4132 | -48.5669 |
| Bottom | 0.94 | 203] 1.5 [DL + RSY] | 4369.5648 | -226.4013 | 41.5226 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3803.8163 | 142.5882 | 63.4566 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 3879.6302 | 193.8246 | 64.01 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4558.7614 | -207.4461 | 8.31 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4558.7614 | 142.5882 | 7.93 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4634.5753 | -140.5051 | 8.04 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4634.5753 | 193.8246 | 8.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.977 | 203] 1.5 [DL + RSY] | 4638.4711 | 226.9018 | -49.2383 |
| Bottom | 0.984 | 203] 1.5 [DL + RSY] | 4714.2849 | -225.8613 | 44.0399 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4094.6234 | 136.8259 | 63.3336 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4170.4372 | 199.7538 | 63.8988 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4928.5837 | -202.4274 | 8.86 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 4928.5837 | 136.8259 | 8.47 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5004.3976 | -141.8324 | 8.62 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5004.3976 | 199.7538 | 8.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.017 | 203] 1.5 [DL + RSY] | 4981.6054 | 224.7141 | -47.593 |
| Bottom | 1.028 | 203] 1.5 [DL + RSY] | 5057.4192 | -224.3814 | 57.1127 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4384.6136 | 130.9878 | 66.9489 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4460.4275 | 219.2985 | 67.521 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5294.8143 | -192.4213 | 9.37 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5294.8143 | 130.9878 | 9.01 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5370.6282 | -135.4442 | 9.15 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5370.6282 | 219.2985 | 9.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.055 | 203] 1.5 [DL + RSY] | 5322.7577 | 222.3749 | -35.1007 |
| Bottom | 1.071 | 203] 1.5 [DL + RSY] | 5398.5716 | -224.121 | 55.9722 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4673.8161 | 132.8164 | 64.9684 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4749.63 | 237.2368 | 65.4639 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5657.138 | -168.2169 | 9.79 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5657.138 | 132.8164 | 9.59 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5732.9518 | -157.9944 | 9.85 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 5732.9518 | 237.2368 | 10.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P20 | 23097.5 | 16230 | 1605 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |
| Bottom | Leg 1 | 22295 | 16230 | 23900 | 16230 | 1605 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.088 | 203] 1.5 [DL + RSY] | 5659.9309 | 215.2043 | -35.2442 |
| Bottom | 1.148 | 203] 1.5 [DL + RSY] | 5735.7447 | -216.618 | -326.8112 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 4961.5482 | 122.7259 | -122.4857 | 223.416 | 686.7725 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5037.3621 | -108.1476 | -122.3306 | 223.416 | 686.7725 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6014.1384 | -161.1151 | 10.31 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6014.1384 | 122.7259 | 10.08 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6089.9523 | -108.1476 | 10.12 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 3864.4894 | 15.7996 | 6.11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.088 | 203] 1.5 [DL + RSY] | 6024.2909 | 257.441 | 766.9158 |
| Bottom | 1.01 | 203] 1.5 [DL + RSY] | 6118.763 | -255.3457 | 91.0271 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5263.9819 | 948.9317 | -258.6282 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5358.454 | 407.1606 | -258.0637 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6374.7073 | 948.9317 | 11.53 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6469.1794 | -277.9731 | 9.13 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6469.1794 | 407.1606 | 9.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.017 | 203] 1.5 [DL + RSY] | 6416.7888 | 239.7976 | 61.3822 |
| Bottom | 1.037 | 203] 1.5 [DL + RSY] | 6511.2609 | -248.5667 | -47.9856 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5566.2273 | 282.6771 | -66.6725 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5660.6994 | 333.1672 | -66.7644 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6757.8798 | -206.5941 | 9.22 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6757.8798 | 282.6771 | 9.51 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6852.3519 | -383.554 | 10 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 6852.3519 | 333.1672 | 9.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.061 | 203] 1.5 [DL + RSY] | 6809.3795 | 235.5176 | -79.8032 |
| Bottom | 1.077 | 203] 1.5 [DL + RSY] | 6903.8516 | -244.5776 | -25.7982 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5867.9668 | 209.3682 | 67.8095 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 5962.4389 | 381.537 | 68.0667 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7137.9778 | -316.2899 | 10.11 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7137.9778 | 209.3682 | 9.71 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7232.4499 | -385.5268 | 10.49 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7232.4499 | 381.537 | 10.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.097 | 203] 1.5 [DL + RSY] | 7201.6092 | 226.8886 | -58.8417 |
| Bottom | 1.118 | 203] 1.5 [DL + RSY] | 7296.0813 | -238.4592 | 34.7094 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6170.0999 | 247.6366 | 64.8906 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6264.572 | 422.0615 | 65.3189 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7515.1923 | -314.3737 | 10.57 | 5 |
| Top–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7515.1923 | 247.6366 | 10.32 | 5 |
| Bottom–Left | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7609.6644 | -402.1213 | 11.02 | 5 |
| Botttom–Right | Leg 1 | 400 | 202] 1.5 [DL + RSX] | 7609.6644 | 422.0615 | 11.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.133 | 203] 1.5 [DL + RSY] | 7592.5869 | 217.5221 | -48.8425 |
| Bottom | 1.158 | 203] 1.5 [DL + RSY] | 7687.059 | -231.7269 | 38.9324 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6472.4763 | 279.0752 | 62.3032 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6566.9484 | 457.2953 | 63.0136 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7888.7584 | -327.2141 | 11.09 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7888.7584 | 279.0752 | 10.91 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7983.2305 | -430.0957 | 11.59 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7983.2305 | 457.2953 | 11.69 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.171 | 202] 1.5 [DL + RSX] | 8258.4265 | 144.782 | -353.7964 |
| Bottom | 1.195 | 203] 1.5 [DL + RSY] | 8076.1967 | -223.1805 | 41.6909 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6775.2606 | 307.5416 | 62.8531 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 6869.7327 | 497.6846 | 63.8753 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8258.4265 | -353.7964 | 11.65 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8258.4265 | 307.5416 | 11.48 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8352.8986 | -465.1096 | 12.19 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8352.8986 | 497.6846 | 12.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 202] 1.5 [DL + RSX] | 8623.9217 | 138.8616 | -390.9184 |
| Bottom | 1.235 | 202] 1.5 [DL + RSX] | 8718.3938 | -143.0309 | 542.8143 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7078.6166 | 344.3411 | 62.7065 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7173.0887 | 542.8143 | 63.9402 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8623.9217 | -390.9184 | 12.25 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8623.9217 | 344.3411 | 12.07 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8718.3938 | -515.6063 | 12.83 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8718.3938 | 542.8143 | 12.93 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.255 | 202] 1.5 [DL + RSX] | 8984.7927 | 130.4996 | -448.3032 |
| Bottom | 1.278 | 202] 1.5 [DL + RSX] | 9079.2648 | -137.7646 | -602.0232 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7382.6493 | 390.3698 | 58.0172 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7477.1214 | 581.3335 | 59.2573 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8984.7927 | -448.3032 | 12.91 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8984.7927 | 390.3698 | 12.69 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9079.2648 | -602.0232 | 13.61 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9079.2648 | 581.3335 | 13.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.295 | 202] 1.5 [DL + RSX] | 9341.7259 | 119.3879 | -546.8329 |
| Bottom | 1.329 | 202] 1.5 [DL + RSX] | 9439.1971 | -142.1199 | -723.7652 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7688.1344 | 432.3443 | 61.8394 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 7785.6056 | 649.724 | 62.819 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9341.7259 | -546.8329 | 13.73 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9341.7259 | 432.3443 | 13.3 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9439.1971 | -723.7652 | 14.51 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9439.1971 | 649.724 | 14.24 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.304 | 202] 1.5 [DL + RSX] | 9744.5476 | 88.9577 | 644.8799 |
| Bottom | 1.343 | 202] 1.5 [DL + RSX] | 9870.5104 | -109.2132 | -1142.0538 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8069.3199 | 644.8799 | -164.1749 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8195.2827 | 1030.236 | -164.8844 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9744.5476 | -445.9696 | 13.85 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 9744.5476 | 644.8799 | 14.6 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 9870.5104 | -1142.0538 | 16.62 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 9870.5104 | 1030.236 | 16.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P20 | 22900 | 16230 | 2000 | 400 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |
| Bottom | Leg 1 | 21900 | 16230 | 23900 | 16230 | 2000 | 400 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.343 | 202] 1.5 [DL + RSX] | 10144.8611 | 40.5923 | 1028.3788 |
| Bottom | 1.484 | 202] 1.5 [DL + RSX] | 10265.4255 | -62.3902 | -1973.4934 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8454.0007 | 1028.3788 | -252.6566 | 278.4 | 855.7913 |
| Bottom | Leg 1 | 1000 | 202] 1.5 [DL + RSX] | 8574.5651 | 1913.2339 | -252.7799 | 278.4 | 855.7913 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10144.8611 | -955.3077 | 16.26 | 5 |
| Top–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10144.8611 | 1028.3788 | 16.54 | 5 |
| Bottom–Left | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10265.4255 | -1973.4934 | 20.23 | 5 |
| Botttom–Right | Leg 1 | 800 | 202] 1.5 [DL + RSX] | 10265.4255 | 1913.2339 | 20.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.197 | 202] 1.5 [DL + RSX] | 1049.0477 | 317.1736 | 621.8251 |
| Bottom | 4.942 | 202] 1.5 [DL + RSX] | 1105.7309 | -288.7911 | -222.2171 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1305.7718 | 644.753 | -275.2795 | 147.7127 | 494.1475 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1362.4551 | -47.8106 | -275.1934 | 149.2907 | 495.7255 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1935.9381 | 621.8251 | 8.89 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1992.6214 | -222.2171 | 5.89 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1116.2268 | 12.9195 | 2.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.235 | 206] [0.9 DL + 1.5 RSX] | 559.772 | 219.5085 | 137.6953 |
| Bottom | 4.245 | 206] [0.9 DL + 1.5 RSX] | 593.7819 | -222.2383 | -145.0317 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1540.0492 | 241.5103 | -123.905 | 154.235 | 500.6698 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1596.7325 | -11.8312 | -124.4861 | 155.813 | 502.2478 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 1930.1329 | -3.1031 | 4.05 | 5 |
| Top–Right | Leg 1 | 300 | 205] 1.2 [DL + LL + RSY] | 2215.6136 | 181.1451 | 6.03 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2272.2968 | -51.333 | 5.13 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1269.3463 | 37.26 | 2.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.025 | 206] [0.9 DL + 1.5 RSX] | 665.85 | 227.3091 | 151.0133 |
| Bottom | 2.948 | 206] [0.9 DL + 1.5 RSX] | 699.86 | -225.1067 | -142.2029 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1773.2552 | 274.3489 | -132.1214 | 190.0699 | 536.5047 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1829.9384 | -2.4176 | -132.7275 | 191.9361 | 538.3709 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2180.1052 | -9.2698 | 4.61 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2496.8382 | 204.0292 | 6.8 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2553.5215 | -48.3431 | 5.7 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1423.4431 | 45.2189 | 3.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.903 | 206] [0.9 DL + 1.5 RSX] | 770.0532 | 226.0441 | 154.7791 |
| Bottom | 2.834 | 206] [0.9 DL + 1.5 RSX] | 804.0632 | -224.6602 | -141.2093 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2005.9993 | 281.1473 | -133.5846 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2062.6826 | 1.186 | -134.253 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2432.0371 | -12.6508 | 5.17 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2780.3759 | 208.4784 | 7.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2837.0591 | -48.8954 | 6.29 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2488.7203 | 1.186 | 5.19 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.125 | 206] [0.9 DL + 1.5 RSX] | 872.6155 | 225.9621 | 155.7057 |
| Bottom | 3.045 | 206] [0.9 DL + 1.5 RSX] | 906.6254 | -224.5112 | -140.4426 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2239.0187 | 281.5834 | -133.7505 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2295.7019 | 4.1902 | -134.4729 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2685.176 | -17.8748 | 5.73 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3066.7403 | 208.4474 | 8.02 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3123.4235 | -48.3001 | 6.88 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2741.8593 | 4.1902 | 5.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.998 | 206] [0.9 DL + 1.5 RSX] | 973.7564 | 225.3032 | 156.0383 |
| Bottom | 2.918 | 206] [0.9 DL + 1.5 RSX] | 1007.7664 | -223.9691 | -139.4162 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2473.1053 | 279.6662 | -133.8558 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2529.7885 | 7.91 | -134.5991 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2939.8013 | -21.0055 | 6.29 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3356.5689 | 207.7705 | 8.62 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3413.2521 | -46.9739 | 7.48 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2996.4846 | 7.91 | 6.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.567 | 206] [0.9 DL + 1.5 RSX] | 1073.7398 | 224.2204 | 155.7138 |
| Bottom | 2.495 | 206] [0.9 DL + 1.5 RSX] | 1107.7497 | -223.0292 | -137.9105 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2709.0377 | 275.4324 | -133.7907 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2765.7209 | 13.4208 | -134.5097 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3196.1752 | -22.0134 | 6.83 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3650.4306 | 206.3976 | 9.22 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3707.1138 | -45.2524 | 8.08 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3252.8585 | 13.4208 | 6.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.438 | 206] [0.9 DL + 1.5 RSX] | 1172.891 | 222.5383 | 154.3148 |
| Bottom | 2.369 | 206] [0.9 DL + 1.5 RSX] | 1206.9009 | -221.5447 | -136.1325 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2947.6055 | 269.1476 | -133.3505 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3004.2888 | 21.3464 | -134.0041 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3454.5381 | -21.2732 | 7.36 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3948.8239 | 203.8897 | 9.82 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4005.5072 | -42.9737 | 8.68 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3511.2214 | 21.3464 | 7.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.298 | 206] [0.9 DL + 1.5 RSX] | 1271.6172 | 220.1476 | 151.5868 |
| Bottom | 2.234 | 206] [0.9 DL + 1.5 RSX] | 1305.6271 | -219.4337 | -134.8469 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3189.6161 | 261.4238 | -132.5203 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3246.2994 | 31.2297 | -133.0852 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3715.1005 | -19.4488 | 7.89 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4252.1562 | 41.9932 | 9.19 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4308.8395 | -40.0896 | 9.29 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3771.7838 | 31.2297 | 8.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.141 | 206] [0.9 DL + 1.5 RSX] | 1370.4429 | 216.7996 | 147.3581 |
| Bottom | 2.089 | 206] [0.9 DL + 1.5 RSX] | 1404.4529 | -216.401 | -134.5818 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3435.9128 | 252.5148 | -130.6139 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3492.596 | 41.9069 | -131.0898 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3978.0518 | -17.7356 | 8.43 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4560.7288 | 194.314 | 11.02 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4617.412 | -35.5855 | 9.9 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4034.7351 | 41.9069 | 8.73 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.999 | 206] [0.9 DL + 1.5 RSX] | 1470.0129 | 212.5174 | 142.1307 |
| Bottom | 1.969 | 202] 1.5 [DL + RSX] | 4931.4869 | -240.0296 | -146.7528 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3687.3592 | 244.0072 | -119.1724 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3744.0425 | 99.9123 | -119.5643 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4243.6614 | -17.4321 | 8.98 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4874.8036 | 187.4457 | 11.62 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4931.4869 | -146.7528 | 11.42 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4931.4869 | 16.4014 | 10.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P21 | 8575 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 8575 | 19125 | 8575 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.982 | 202] 1.5 [DL + RSX] | 5192.917 | 228.8182 | 211.9318 |
| Bottom | 2.079 | 202] 1.5 [DL + RSX] | 5249.6003 | -226.7933 | -432.9139 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3944.0953 | 272.1106 | -219.6751 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4000.7786 | -178.0486 | -219.7572 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2819.8597 | -33.0697 | 6.13 | 5 |
| Top–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 5192.917 | 211.9318 | 12.47 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5249.6003 | -288.6329 | 13.19 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.286 | 206] [0.9 DL + 1.5 RSX] | 1652.3298 | 223.6066 | 826.4885 |
| Bottom | 1.668 | 206] [0.9 DL + 1.5 RSX] | 1699.0935 | -219.1563 | -196.7712 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4206.1774 | 1351.4972 | -517.0295 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4284.1169 | 216.3083 | -517.0503 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5566.3991 | 1295.3561 | 13.79 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5644.3386 | -24.7021 | 8.65 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4895.1732 | 216.3083 | 8.31 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.557 | 202] 1.5 [DL + RSX] | 5947.9019 | 223.8845 | 253.8852 |
| Bottom | 1.582 | 202] 1.5 [DL + RSX] | 6025.8414 | -228.9295 | -251.187 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4458.1495 | 372.2783 | -190.7577 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4536.089 | 236.7377 | -191.3252 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5146.5893 | -80.8573 | 8.13 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5947.9019 | 253.8852 | 10.06 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6025.8414 | -39.9005 | 9.29 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5224.5288 | 236.7377 | 8.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.592 | 202] 1.5 [DL + RSX] | 6328.4467 | 218.7512 | 228.859 |
| Bottom | 1.611 | 202] 1.5 [DL + RSX] | 6406.3862 | -221.8364 | -220.7727 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4711.1782 | 363.0895 | -175.3777 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4789.1177 | 283.0126 | -176.1995 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5474.935 | -111.6531 | 8.76 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6328.4467 | 22.5774 | 9.68 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6406.3862 | -17.7481 | 9.78 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5552.8745 | 283.0126 | 9.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.615 | 202] 1.5 [DL + RSX] | 6708.0323 | 207.1058 | 236.14 |
| Bottom | 1.634 | 202] 1.5 [DL + RSX] | 6785.9718 | -211.5907 | -209.6907 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4966.4165 | 376.1122 | -177.5871 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5044.356 | 313.05 | -178.5709 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5802.1102 | -95.0351 | 9.18 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6708.0323 | 236.14 | 11.14 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6785.9718 | -14.3912 | 10.34 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5880.0497 | 313.05 | 10.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.631 | 202] 1.5 [DL + RSX] | 7086.1562 | 194.2631 | 228.1656 |
| Bottom | 1.653 | 202] 1.5 [DL + RSX] | 7164.0957 | -199.7993 | -203.3497 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5224.6013 | 369.8597 | -173.9873 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5302.5408 | 349.7752 | -175.0584 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6127.7767 | -98.0136 | 9.69 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7086.1562 | 228.1656 | 11.68 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7164.0957 | -9.0205 | 10.89 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6205.7162 | 349.7752 | 10.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.642 | 202] 1.5 [DL + RSX] | 7462.3151 | 179.09 | 217.8576 |
| Bottom | 1.668 | 202] 1.5 [DL + RSX] | 7540.2545 | -186.0089 | -201.3895 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5486.6194 | 372.2296 | -168.612 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5564.5588 | 398.3668 | -169.6862 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6451.876 | -114.4039 | 10.25 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7462.3151 | 217.8576 | 12.21 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7540.2545 | -201.3895 | 12.26 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7540.2545 | 2.9476 | 11.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.666 | 202] 1.5 [DL + RSX] | 7835.7171 | 161.2599 | 209.5123 |
| Bottom | 1.696 | 202] 1.5 [DL + RSX] | 7913.6566 | -169.7824 | -206.8645 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5753.3525 | 395.9833 | -161.9548 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5831.292 | 462.1313 | -162.9377 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6774.3309 | -152.1438 | 10.89 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7835.7171 | 209.5123 | 12.74 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7913.6566 | -206.8645 | 12.85 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7913.6566 | 25.6436 | 12.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.684 | 202] 1.5 [DL + RSX] | 8205.0011 | 140.4721 | 208.4915 |
| Bottom | 1.722 | 202] 1.5 [DL + RSX] | 8282.9406 | -151.3679 | -226.0402 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6025.5688 | 449.1908 | -153.8817 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6103.5082 | 540.205 | -154.6911 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7094.8583 | -218.4848 | 11.65 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8205.0011 | 208.4915 | 13.29 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8282.9406 | -226.0402 | 13.48 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8282.9406 | 62.4226 | 12.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.696 | 202] 1.5 [DL + RSX] | 8569.6161 | 114.811 | 224.7488 |
| Bottom | 1.747 | 202] 1.5 [DL + RSX] | 8650.0299 | -131.232 | -260.3021 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6304.1178 | 530.9502 | -138.3588 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6384.5316 | 616.5525 | -138.9701 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8569.6161 | -6.1191 | 13.01 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8569.6161 | 224.7488 | 13.91 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8650.0299 | -260.3021 | 14.18 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8650.0299 | 105.5189 | 13.54 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.263 | 202] 1.5 [DL + RSX] | 8922.0301 | 340.1374 | 229.7157 |
| Bottom | 2.317 | 202] 1.5 [DL + RSX] | 9025.9494 | 343.1926 | -397.5606 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6587.5444 | 604.7305 | -120.8082 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6691.4637 | 757.7128 | -121.2081 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8922.0301 | -71.8802 | 13.82 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8922.0301 | 229.7157 | 14.47 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9025.9494 | -397.5606 | 15.32 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9025.9494 | 186.9655 | 14.45 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P21 | 8575 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 8575 | 18525 | 8575 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.232 | 202] 1.5 [DL + RSX] | 9327.109 | 300.7892 | 356.998 |
| Bottom | 2.272 | 202] 1.5 [DL + RSX] | 9426.5746 | 303.4683 | 452.5692 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6948.7976 | 841.4167 | -120.0009 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7048.2633 | 1193.6049 | -120.0695 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9327.109 | -185.9731 | 14.9 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9327.109 | 356.998 | 15.61 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9426.5746 | -410.8993 | 15.98 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9426.5746 | 452.5692 | 16.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.098 | 202] 1.5 [DL + RSX] | 1127.1283 | -316.3692 | 675.9958 |
| Bottom | 4.806 | 202] 1.5 [DL + RSX] | 1183.8115 | 288.2261 | -239.995 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1399.3428 | 697.8566 | -298.836 | 150.3177 | 496.7525 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1456.026 | -65.1824 | -298.7776 | 151.8958 | 498.3305 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2046.3713 | 675.9958 | 9.54 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2103.0546 | -102.51 | 5.18 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1173.4669 | 3.3187 | 2.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.18 | 206] [0.9 DL + 1.5 RSX] | 591.1171 | -219.5398 | 139.2027 |
| Bottom | 4.196 | 206] [0.9 DL + 1.5 RSX] | 625.1271 | 222.2828 | -151.0348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1615.8589 | 246.126 | -129.707 | 156.3455 | 502.7803 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1672.5421 | -21.3808 | -130.2978 | 157.9236 | 504.3584 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2001.6751 | -27.1309 | 4.38 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2302.91 | 183.0017 | 6.23 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2359.5933 | -63.578 | 5.41 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1312.1782 | 32.2724 | 2.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.008 | 206] [0.9 DL + 1.5 RSX] | 688.8002 | -227.4314 | 155.7473 |
| Bottom | 2.933 | 206] [0.9 DL + 1.5 RSX] | 722.8102 | 225.3358 | -147.3053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1832.8297 | 286.0395 | -139.7569 | 192.0313 | 538.4661 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1889.5129 | -10.2839 | -140.3753 | 193.8974 | 540.3322 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2231.8738 | -6.8776 | 4.7 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2562.9626 | 211.5797 | 6.99 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2619.6458 | -58.839 | 5.92 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1452.943 | 41.2522 | 3.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.897 | 206] [0.9 DL + 1.5 RSX] | 785.2286 | -226.3264 | 159.9418 |
| Bottom | 2.829 | 206] [0.9 DL + 1.5 RSX] | 819.2386 | 225.0648 | -145.8691 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2050.6648 | 293.3551 | -141.335 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2107.348 | -5.9943 | -142.0168 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2464.6348 | -9.8211 | 5.21 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2827.011 | 216.6485 | 7.58 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2883.6943 | -58.6438 | 6.47 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1595.5848 | 45.1339 | 3.68 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.129 | 206] [0.9 DL + 1.5 RSX] | 880.5785 | -226.376 | 160.9052 |
| Bottom | 3.05 | 206] [0.9 DL + 1.5 RSX] | 914.5884 | 225.0689 | -144.7075 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2270.0035 | 293.2742 | -141.3706 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2326.6868 | -2.248 | -142.103 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2700.0426 | -15.0603 | 5.74 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3095.4584 | 216.5479 | 8.14 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3152.1417 | -57.3284 | 7.01 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1740.0433 | 48.261 | 4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.012 | 206] [0.9 DL + 1.5 RSX] | 975.0324 | -225.8459 | 161.2641 |
| Bottom | 2.933 | 206] [0.9 DL + 1.5 RSX] | 1009.0424 | 224.6717 | -143.4073 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2491.559 | 290.7505 | -141.4053 | 183.5564 | 529.9912 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2548.2423 | 2.2898 | -142.1515 | 183.5564 | 529.9912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2938.2941 | -17.9879 | 6.26 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3368.8501 | 215.8166 | 8.7 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3425.5333 | -55.4978 | 7.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2994.9773 | 2.2898 | 6.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.588 | 206] [0.9 DL + 1.5 RSX] | 1068.818 | -224.8939 | 160.8751 |
| Bottom | 2.518 | 206] [0.9 DL + 1.5 RSX] | 1102.828 | 223.8767 | -141.7215 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2716.0376 | 285.7791 | -141.2367 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2772.7209 | 8.7863 | -141.9497 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3179.5812 | -18.8688 | 6.77 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3647.6771 | 214.2571 | 9.27 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3704.3603 | -53.451 | 8.14 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3236.2645 | 8.7863 | 6.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.467 | 206] [0.9 DL + 1.5 RSX] | 1162.2336 | -223.3519 | 159.3437 |
| Bottom | 2.4 | 206] [0.9 DL + 1.5 RSX] | 1196.2435 | 222.5434 | -139.8568 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2944.1694 | 278.8116 | -140.6537 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3000.8527 | 17.7628 | -141.294 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3424.0953 | -18.2178 | 7.28 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3932.3782 | 211.4625 | 9.84 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3989.0614 | -50.9932 | 8.71 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3480.7785 | 17.7628 | 7.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.335 | 206] [0.9 DL + 1.5 RSX] | 1255.6667 | -221.1198 | 156.4111 |
| Bottom | 2.273 | 206] [0.9 DL + 1.5 RSX] | 1289.6766 | 220.6023 | -138.6031 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3176.713 | 270.5871 | -139.6518 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3233.3963 | 28.5036 | -140.2002 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3672.0201 | -16.8108 | 7.78 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4223.3198 | 46.6099 | 9.16 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4280.0031 | -48.0785 | 9.29 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3728.7034 | 28.5036 | 7.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.185 | 206] [0.9 DL + 1.5 RSX] | 1349.6398 | -217.955 | 151.8825 |
| Bottom | 2.132 | 206] [0.9 DL + 1.5 RSX] | 1383.6498 | 217.7566 | -138.2026 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3414.4813 | 261.3661 | -137.4006 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3471.1645 | 40.3983 | -137.8618 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3923.5476 | -15.9118 | 8.3 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4520.7833 | 200.9734 | 10.99 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4577.4665 | -42.9736 | 9.87 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3980.2308 | 40.3983 | 8.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.039 | 206] [0.9 DL + 1.5 RSX] | 1444.7672 | -213.8683 | 146.5693 |
| Bottom | 2.007 | 206] [0.9 DL + 1.5 RSX] | 1478.7772 | 214.8431 | -125.6567 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3658.2775 | 253.2476 | -126.7179 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3714.9608 | 96.4079 | -127.1054 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4178.9327 | -16.0309 | 8.83 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4825.001 | 194.0127 | 11.57 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4881.6842 | -155.4531 | 11.38 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4881.6842 | 6.4715 | 10.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P22 | 18765 | 19925 | 1600 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |
| Bottom | Leg 1 | 18765 | 19125 | 18765 | 20725 | 1600 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.991 | 202] 1.5 [DL + RSX] | 5134.6399 | -232.1072 | 215.7212 |
| Bottom | 2.091 | 202] 1.5 [DL + RSX] | 5191.3232 | 230.612 | -438.4613 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3908.3837 | 278.4555 | -224.6844 | 197.5349 | 543.9697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3965.0669 | -177.254 | -224.7799 | 197.5349 | 543.9697 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2768.1605 | -35.5523 | 6.04 | 5 |
| Top–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 5134.6399 | 215.7212 | 12.38 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5191.3232 | -292.8905 | 13.1 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.341 | 206] [0.9 DL + 1.5 RSX] | 1622.754 | -226.5127 | 815.0083 |
| Bottom | 1.733 | 206] [0.9 DL + 1.5 RSX] | 1669.5177 | 222.1492 | -191.8008 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4170.2011 | 1339.7156 | -515.0332 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4248.1406 | 231.5614 | -515.0652 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5506.8974 | 1277.6691 | 13.62 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5584.8369 | -18.7677 | 8.54 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4819.8026 | 231.5614 | 8.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.562 | 202] 1.5 [DL + RSX] | 5887.2169 | -227.5844 | 268.482 |
| Bottom | 1.586 | 202] 1.5 [DL + RSX] | 5965.1564 | 233.0611 | -250.1333 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4421.0876 | 390.5657 | -197.6483 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4499.0271 | 241.564 | -198.244 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5069.9006 | -72.5982 | 7.98 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5887.2169 | 268.482 | 10.03 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5965.1564 | -42.5778 | 9.21 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5147.8401 | 241.564 | 8.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.594 | 202] 1.5 [DL + RSX] | 6266.3517 | -222.2019 | 235.4822 |
| Bottom | 1.612 | 202] 1.5 [DL + RSX] | 6344.2911 | 225.5484 | -220.3858 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4672.7855 | 370.7638 | -180.1874 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4750.725 | 285.7231 | -181.0277 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5396.8357 | -110.2093 | 8.63 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6266.3517 | 25.0724 | 9.6 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6344.2911 | -21.6226 | 9.7 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5474.7751 | 285.7231 | 9.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.615 | 202] 1.5 [DL + RSX] | 6644.4046 | -210.0992 | 240.6175 |
| Bottom | 1.634 | 202] 1.5 [DL + RSX] | 6722.3441 | 214.8694 | -208.447 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4926.4548 | 379.4455 | -181.3973 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5004.3943 | 316.2512 | -182.3914 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5722.4939 | -94.1911 | 9.06 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6644.4046 | 240.6175 | 11.06 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6722.3441 | -17.1431 | 10.26 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5800.4334 | 316.2512 | 10.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.629 | 202] 1.5 [DL + RSX] | 7020.8791 | -196.8402 | 232.2971 |
| Bottom | 1.651 | 202] 1.5 [DL + RSX] | 7098.8186 | 202.6567 | -201.6649 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5182.8876 | 370.7549 | -177.3894 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5260.8271 | 353.4245 | -178.4623 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6046.5416 | -95.7719 | 9.56 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7020.8791 | 232.2971 | 11.6 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7098.8186 | -10.9756 | 10.8 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6124.4811 | 353.4245 | 10.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.637 | 202] 1.5 [DL + RSX] | 7395.259 | -181.2658 | 221.1777 |
| Bottom | 1.664 | 202] 1.5 [DL + RSX] | 7473.1985 | 188.4598 | -199.3453 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5442.9673 | 370.5714 | -171.4708 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5520.9068 | 402.7749 | -172.5384 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6368.9032 | -111.3289 | 10.11 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7395.259 | 221.1777 | 12.12 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7473.1985 | -199.3453 | 12.15 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7473.1985 | 1.7528 | 11.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.658 | 202] 1.5 [DL + RSX] | 7766.7327 | -163.0455 | 211.6669 |
| Bottom | 1.689 | 202] 1.5 [DL + RSX] | 7844.6722 | 171.8695 | -204.2891 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5707.5701 | 392.6591 | -164.1152 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5785.5096 | 467.6523 | -165.0856 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6689.4856 | -149.253 | 10.75 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7766.7327 | 211.6669 | 12.64 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7844.6722 | -204.2891 | 12.73 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7844.6722 | 25.3299 | 11.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.675 | 202] 1.5 [DL + RSX] | 8133.9325 | -141.7912 | 209.0815 |
| Bottom | 1.713 | 202] 1.5 [DL + RSX] | 8211.872 | 152.9129 | -223.4369 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5977.4764 | 445.5208 | -155.3651 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6055.4158 | 544.9652 | -156.1607 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7008.0142 | -216.749 | 11.51 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8133.9325 | 209.0815 | 13.19 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8211.872 | -223.4369 | 13.37 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8211.872 | 61.4316 | 12.7 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.685 | 202] 1.5 [DL + RSX] | 8496.1935 | -115.9465 | 221.4729 |
| Bottom | 1.739 | 202] 1.5 [DL + RSX] | 8576.6073 | 133.2517 | -267.2862 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6253.4349 | 525.3849 | -141.8855 | 236.3738 | 712.7216 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6333.8487 | 609.0347 | -142.4846 | 236.3738 | 712.7216 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8496.1935 | -8.9095 | 12.91 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8496.1935 | 221.4729 | 13.79 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7405.5203 | -783.6994 | 14.46 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8576.6073 | 92.6215 | 13.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.23 | 202] 1.5 [DL + RSX] | 8838.1145 | 332.1589 | 241.0956 |
| Bottom | 2.286 | 202] 1.5 [DL + RSX] | 8942.0338 | 335.2142 | -411.8905 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6525.2259 | 618.2799 | -130.334 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6629.1452 | 766.4633 | -130.7213 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8838.1145 | -56.235 | 13.62 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8838.1145 | 241.0956 | 14.39 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8942.0338 | -411.8905 | 15.25 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8942.0338 | 182.938 | 14.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P22 | 18765 | 19625 | 2200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |
| Bottom | Leg 1 | 18765 | 18525 | 18765 | 20725 | 2200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.18 | 202] 1.5 [DL + RSX] | 9208.586 | 288.0111 | 358.2356 |
| Bottom | 2.219 | 202] 1.5 [DL + RSX] | 9308.0516 | 290.6901 | 449.8887 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6862.644 | 848.3605 | -128.6617 | 257.6263 | 733.9742 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6962.1096 | 1204.3738 | -128.7285 | 257.6263 | 733.9742 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9208.586 | -166.6844 | 14.64 | 5 |
| Top–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9208.586 | 358.2356 | 15.43 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9308.0516 | -419.1439 | 15.84 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 9308.0516 | 449.8887 | 15.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.822 | 202] 1.5 [DL + RSX] | 1075.9086 | -132.246 | -177.2611 |
| Bottom | 1.287 | 202] 1.5 [DL + RSX] | 1118.4211 | 120.261 | -32.1574 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 925.2654 | -138.469 | 57.578 | 121.3722 | 381.1983 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 967.7778 | 38.2468 | 57.9252 | 122.6867 | 382.5128 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1428.7621 | -138.469 | 5.89 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1471.2746 | -45.6257 | 4.72 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1471.2746 | 38.2468 | 4.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.18 | 202] 1.5 [DL + RSX] | 1532.9696 | -114.4382 | 59.3631 |
| Bottom | 1.163 | 202] 1.5 [DL + RSX] | 1575.482 | 115.1126 | -32.8916 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1151.8489 | 86.4755 | -35.0343 | 128.3783 | 388.2044 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1194.3613 | 47.514 | -35.4985 | 129.6928 | 389.5189 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1678.3949 | -54.7384 | 5.42 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1678.3949 | 86.4755 | 5.86 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1720.9073 | -53.7649 | 5.53 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1720.9073 | 47.514 | 5.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.234 | 202] 1.5 [DL + RSX] | 1796.2541 | -116.6234 | 71.1808 |
| Bottom | 1.187 | 202] 1.5 [DL + RSX] | 1838.7666 | 115.1195 | -34.8614 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1376.1179 | 93.373 | -38.0926 | 135.3129 | 395.139 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1418.6304 | 48.6546 | -38.6069 | 136.6274 | 396.4535 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1928.9712 | -56.954 | 6.15 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1928.9712 | 93.373 | 6.66 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1971.4836 | -64.0776 | 6.37 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1971.4836 | 48.6546 | 6.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.254 | 202] 1.5 [DL + RSX] | 2064.6948 | -115.4786 | 72.1676 |
| Bottom | 1.226 | 202] 1.5 [DL + RSX] | 2107.2073 | 114.3252 | -34.2381 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1598.0005 | 92.0133 | -37.5517 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1640.513 | 52.4535 | -38.1107 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2179.7425 | -62.9886 | 6.93 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2179.7425 | 92.0133 | 7.33 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2222.2549 | -67.8202 | 7.11 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2222.2549 | 52.4535 | 6.9 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.308 | 202] 1.5 [DL + RSX] | 2336.3149 | -114.9 | 76.1027 |
| Bottom | 1.279 | 202] 1.5 [DL + RSX] | 2378.8274 | 113.7441 | -36.4863 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1817.6277 | 93.588 | -38.4556 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1860.1401 | 54.1338 | -39.0442 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2430.599 | -63.1501 | 7.63 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2430.599 | 93.588 | 8.05 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2473.1115 | -71.1947 | 7.86 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2473.1115 | 54.1338 | 7.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.361 | 202] 1.5 [DL + RSX] | 2609.9212 | -114.0312 | 78.5152 |
| Bottom | 1.331 | 202] 1.5 [DL + RSX] | 2652.4337 | 113.0196 | -39.0262 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2034.9846 | 93.474 | -39.0239 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2077.4971 | 55.6357 | -39.6161 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2681.4936 | -63.4856 | 8.33 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2681.4936 | 93.474 | 8.75 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2724.0061 | -74.0056 | 8.59 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2724.0061 | 55.6357 | 8.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.316 | 202] 1.5 [DL + RSX] | 2884.7382 | -113.0456 | 80.1958 |
| Bottom | 1.304 | 202] 1.5 [DL + RSX] | 2927.2507 | 112.1795 | -41.0223 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2249.8956 | 92.6854 | -39.5141 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2292.4081 | 57.6715 | -40.0797 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2932.4485 | -62.9637 | 9.02 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2932.4485 | 92.6854 | 9.43 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2974.9609 | -76.7317 | 9.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2974.9609 | 57.6715 | 9.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.38 | 202] 1.5 [DL + RSX] | 3160.2326 | -111.8662 | 80.6614 |
| Bottom | 1.37 | 202] 1.5 [DL + RSX] | 3202.745 | 111.2119 | -43.1947 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2462.1457 | 91.3902 | -39.7752 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2504.6582 | 60.5008 | -40.2876 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3183.5389 | -61.4467 | 9.7 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3183.5389 | 91.3902 | 10.11 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3226.0514 | -79.3013 | 10.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3226.0514 | 60.5008 | 9.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.5 | 202] 1.5 [DL + RSX] | 3435.9792 | -110.3772 | 79.6605 |
| Bottom | 1.491 | 202] 1.5 [DL + RSX] | 3478.4916 | 109.9492 | -46.2455 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2671.5103 | 90.1619 | -39.4223 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2714.0228 | 64.8896 | -39.8631 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3435.9792 | -48.5485 | 10.22 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3435.9792 | 79.6605 | 10.65 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3478.4916 | -46.2455 | 10.3 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3478.4916 | 30.7855 | 10.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.563 | 202] 1.5 [DL + RSX] | 3711.614 | -108.6548 | 78.197 |
| Bottom | 1.566 | 202] 1.5 [DL + RSX] | 3754.1264 | 108.6564 | -63.075 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2877.7834 | 90.9249 | -42.568 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2920.2959 | 59.4442 | -42.9268 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3711.614 | -42.5089 | 10.9 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3711.614 | 78.197 | 11.4 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3754.1264 | -63.075 | 11.3 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3754.1264 | 31.31 | 10.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.556 | 202] 1.5 [DL + RSX] | 3986.553 | -106.3341 | 63.7619 |
| Bottom | 1.584 | 202] 1.5 [DL + RSX] | 4029.0654 | 104.6125 | -112.3952 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3080.6941 | 82.3892 | -52.9387 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3123.2065 | 42.6674 | -53.2019 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3986.553 | -43.8858 | 11.68 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3986.553 | 63.7619 | 11.96 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4029.0654 | -112.3952 | 12.75 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4029.0654 | 20.6958 | 11.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P23 | 0 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.635 | 202] 1.5 [DL + RSX] | 4258.453 | -108.2054 | -66.3243 |
| Bottom | 1.808 | 202] 1.5 [DL + RSX] | 4300.9654 | 119.6029 | 296.6858 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3278.6092 | 41.6153 | 106.3048 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3321.1216 | 310.945 | 106.3851 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4258.453 | -66.3243 | 12.75 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4258.453 | 18.4274 | 12.08 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4300.9654 | 296.6858 | 16.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.92 | 202] 1.5 [DL + RSX] | 4568.5184 | -204.962 | -787.0939 |
| Bottom | 1.613 | 202] 1.5 [DL + RSX] | 4628.7444 | 194.9247 | -151.4295 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3379.5887 | -546.1766 | 226.0562 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3439.8146 | 70.2605 | 226.2057 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4568.5184 | -546.1766 | 12.74 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4628.7444 | -151.4295 | 10.12 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4628.7444 | 70.2605 | 9.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.592 | 202] 1.5 [DL + RSX] | 4905.905 | -184.9107 | -68.262 |
| Bottom | 1.632 | 202] 1.5 [DL + RSX] | 4966.131 | 188.4516 | 125.4975 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3714.2603 | 78.7792 | 54.2258 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3774.4863 | 208.6499 | 54.5486 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4905.905 | -68.262 | 10.09 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4905.905 | 35.4127 | 9.86 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4966.131 | -56.0952 | 10.13 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4966.131 | 125.4975 | 10.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.651 | 202] 1.5 [DL + RSX] | 5241.4469 | -180.1478 | 119.9067 |
| Bottom | 1.666 | 202] 1.5 [DL + RSX] | 5301.6729 | 183.4732 | -91.8896 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3931.2927 | 165.2846 | -63.4786 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3991.5187 | 181.2156 | -64.0022 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5016.8008 | -42.2357 | 10.13 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5241.4469 | 119.9067 | 11.11 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5301.6729 | -91.8896 | 11.03 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5301.6729 | 84.7557 | 10.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.678 | 202] 1.5 [DL + RSX] | 5574.6959 | -173.6357 | 84.7253 |
| Bottom | 1.709 | 202] 1.5 [DL + RSX] | 5634.9218 | 177.6204 | -103.597 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4146.1774 | 131.3968 | -55.5496 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4206.4034 | 185.5873 | -56.2365 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5574.6959 | -31.866 | 11.15 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5574.6959 | 84.7253 | 11.52 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5634.9218 | -103.597 | 11.77 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5634.9218 | 79.0633 | 11.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.71 | 202] 1.5 [DL + RSX] | 5904.5309 | -166.8149 | 72.1951 |
| Bottom | 1.751 | 202] 1.5 [DL + RSX] | 5964.7569 | 171.6206 | -110.8648 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4358.8409 | 124.1404 | -52.0703 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4419.0669 | 202.5728 | -52.8588 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5904.5309 | -33.6404 | 11.81 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5904.5309 | 72.1951 | 12.08 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5964.7569 | -110.8648 | 12.46 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5964.7569 | 89.8191 | 12.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.746 | 202] 1.5 [DL + RSX] | 6230.2057 | -158.5582 | 66.8492 |
| Bottom | 1.79 | 202] 1.5 [DL + RSX] | 6290.4317 | 164.5437 | -125.9741 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4569.8822 | 131.9313 | -51.5105 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4630.1082 | 222.038 | -52.3307 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6230.2057 | -21.6929 | 12.37 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6230.2057 | 66.8492 | 12.68 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6290.4317 | -125.9741 | 13.21 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6290.4317 | 107.514 | 13.08 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.786 | 202] 1.5 [DL + RSX] | 6550.7192 | -149.0485 | 64.2984 |
| Bottom | 1.835 | 202] 1.5 [DL + RSX] | 6610.9451 | 156.677 | -152.4532 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4780.0531 | 148.5613 | -51.3768 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4840.279 | 242.9494 | -52.1529 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6550.7192 | -12.7262 | 12.93 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6550.7192 | 64.2984 | 13.29 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6610.9451 | -152.4532 | 14.02 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6610.9451 | 131.6562 | 13.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.823 | 202] 1.5 [DL + RSX] | 6864.734 | -137.3113 | 78.2028 |
| Bottom | 1.876 | 202] 1.5 [DL + RSX] | 6924.96 | 145.0757 | -185.3628 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4990.2281 | 174.3371 | -48.8669 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5050.4541 | 277.3928 | -49.5267 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6864.734 | -24.5878 | 13.63 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6864.734 | 78.2028 | 14 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6924.96 | -185.3628 | 14.86 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6924.96 | 175.5207 | 14.79 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.87 | 202] 1.5 [DL + RSX] | 7170.757 | -127.0908 | 124.7212 |
| Bottom | 1.977 | 202] 1.5 [DL + RSX] | 7232.8949 | 150.8599 | 318.7749 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5200.8597 | 219.0289 | 54.4695 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5262.9976 | 412.0867 | 54.9382 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7170.757 | -55.3645 | 14.44 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7170.757 | 124.7212 | 14.92 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7232.8949 | -190.9096 | 15.5 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7232.8949 | 318.7749 | 16.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.535 | 202] 1.5 [DL + RSX] | 7653.6203 | -290.2037 | -268.062 |
| Bottom | 2.652 | 202] 1.5 [DL + RSX] | 7733.9216 | 292.5646 | 519.2359 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5071.8103 | 5.5864 | 117.9768 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5152.1116 | 519.2359 | 118.0256 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7653.6203 | -268.062 | 16.86 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7653.6203 | 5.5864 | 15.05 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7733.9216 | -269.7109 | 17.03 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7733.9216 | 519.2359 | 18.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P23 | 0 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 0 | 20524 | 0 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.524 | 202] 1.5 [DL + RSX] | 8160.0265 | -250.3049 | -407.7212 |
| Bottom | 2.602 | 202] 1.5 [DL + RSX] | 8236.8863 | 252.3751 | 618.7111 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5493.1597 | 204.5444 | 100.6914 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5570.0195 | 618.7111 | 100.6995 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8160.0265 | -407.7212 | 18.82 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8160.0265 | 204.5444 | 17.42 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8236.8863 | -505.3305 | 19.65 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8236.8863 | 618.7111 | 20.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.137 | 206] [0.9 DL + 1.5 RSX] | 955.1233 | 143.8524 | -151.1922 |
| Bottom | 1.856 | 206] [0.9 DL + 1.5 RSX] | 980.6307 | -141.9192 | -42.0638 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1710.1625 | -118.307 | 101.0345 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1752.675 | 46.6949 | 101.3911 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1875.7564 | -177.2096 | 7.67 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1918.2688 | -52.0782 | 6.05 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1918.2688 | 2.0064 | 5.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.871 | 206] [0.9 DL + 1.5 RSX] | 1039.8652 | 140.4644 | 100.1582 |
| Bottom | 1.761 | 206] [0.9 DL + 1.5 RSX] | 1065.3726 | -139.7623 | -61.4374 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1936.6698 | 198.896 | -97.7499 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1979.1823 | 5.0938 | -98.2573 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1225.2481 | -23.8395 | 3.73 | 5 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2122.0527 | 143.9223 | 7.89 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2164.5652 | -47.2146 | 6.67 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2058.24 | 5.0938 | 5.79 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.765 | 206] [0.9 DL + 1.5 RSX] | 1129.1439 | 141.7122 | 77.4381 |
| Bottom | 1.677 | 206] [0.9 DL + 1.5 RSX] | 1154.6514 | -140.5655 | -56.1135 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2136.6529 | 158.0058 | -82.318 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2179.1653 | 15.6955 | -82.7971 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2244.1161 | -29.2933 | 6.64 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2375.4713 | 103.1806 | 8.03 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2417.9837 | -41.3794 | 7.29 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2286.6286 | 15.6955 | 6.57 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.717 | 202] 1.5 [DL + RSX] | 2634.4881 | 159.5696 | 109.7117 |
| Bottom | 1.68 | 202] 1.5 [DL + RSX] | 2677.0005 | -158.4475 | -79.1407 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2322.9031 | 162.6677 | -83.119 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2365.4155 | 19.8537 | -83.6148 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2497.1709 | -28.203 | 7.33 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2634.4881 | 109.7117 | 8.84 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2677.0005 | -39.9634 | 7.99 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2539.6833 | 19.8537 | 7.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.618 | 202] 1.5 [DL + RSX] | 2899.3526 | 159.3547 | 109.1711 |
| Bottom | 1.6 | 202] 1.5 [DL + RSX] | 2941.865 | -158.2929 | -78.6827 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2509.5059 | 160.3698 | -81.7794 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2552.0184 | 23.7444 | -82.2872 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2761.8976 | -31.4178 | 8.11 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2899.3526 | 109.1711 | 9.57 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2941.865 | -36.9325 | 8.68 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2804.41 | 23.7444 | 8.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.669 | 202] 1.5 [DL + RSX] | 3170.2908 | 158.8972 | 108.3551 |
| Bottom | 1.651 | 202] 1.5 [DL + RSX] | 3212.8033 | -157.9329 | -78.3856 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2699.4951 | 157.764 | -80.4979 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2742.0075 | 27.9111 | -81.0063 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3035.6555 | -33.9837 | 8.9 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3170.2908 | 108.3551 | 10.31 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3212.8033 | -33.2135 | 9.39 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3078.168 | 27.9111 | 8.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.718 | 202] 1.5 [DL + RSX] | 3447.715 | 158.1441 | 106.9536 |
| Bottom | 1.702 | 202] 1.5 [DL + RSX] | 3490.2274 | -157.3208 | -77.8505 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2893.7522 | 154.3604 | -79.1048 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2936.2646 | 32.7453 | -79.5939 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3318.2669 | -35.7886 | 9.71 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3447.715 | 106.9536 | 11.06 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3490.2274 | -29.1685 | 10.1 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3360.7793 | 32.7453 | 9.79 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.766 | 202] 1.5 [DL + RSX] | 3732.087 | 157.0312 | 104.6209 |
| Bottom | 1.752 | 202] 1.5 [DL + RSX] | 3774.5994 | -156.4009 | -77.5591 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3092.6889 | 150.1721 | -77.514 | 158.3508 | 418.1769 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3135.2014 | 38.3462 | -77.9636 | 158.3508 | 418.1769 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3610.0745 | -36.8132 | 10.54 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3732.087 | 104.6209 | 11.82 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3774.5994 | -24.3142 | 10.82 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3652.5869 | 38.3462 | 10.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.82 | 202] 1.5 [DL + RSX] | 4023.9349 | 155.4882 | 101.0078 |
| Bottom | 1.818 | 202] 1.5 [DL + RSX] | 4066.4473 | -155.0618 | -78.731 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3296.6669 | 145.3674 | -75.725 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3339.1793 | 44.267 | -76.1222 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3911.5952 | -37.2779 | 11.38 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4023.9349 | 101.0078 | 12.58 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4066.4473 | -17.9688 | 11.55 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3954.1077 | 44.267 | 11.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.884 | 202] 1.5 [DL + RSX] | 4323.7993 | 153.5668 | 95.5064 |
| Bottom | 1.887 | 202] 1.5 [DL + RSX] | 4366.3118 | -153.7586 | -76.65 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3506.0935 | 139.9572 | -71.9625 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3548.606 | 56.7439 | -72.3027 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4223.3914 | -37.8292 | 12.26 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4323.7993 | 6.6215 | 12.1 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4366.3118 | -3.1893 | 12.17 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4265.9039 | 56.7439 | 12.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.944 | 202] 1.5 [DL + RSX] | 4632.1628 | 149.8703 | 93.7207 |
| Bottom | 1.974 | 202] 1.5 [DL + RSX] | 4674.6752 | -149.6077 | -136.6765 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3721.1999 | 140.112 | -86.5663 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3763.7124 | 1.1945 | -86.8602 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4545.9759 | -32.0426 | 13.07 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4632.1628 | 93.7207 | 14.17 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4674.6752 | -47.4595 | 13.64 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4588.4884 | 1.1945 | 12.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P24 | 5045 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.995 | 202] 1.5 [DL + RSX] | 4950.5215 | 149.0592 | -43.9851 |
| Bottom | 2.154 | 202] 1.5 [DL + RSX] | 4993.034 | -154.8505 | 299.5523 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3943.5955 | 82.0819 | 135.95 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3986.1079 | 388.6816 | 136.0682 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4950.5215 | -43.9851 | 14.36 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4950.5215 | 26.4584 | 14.12 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3141.8631 | -23.2101 | 9.05 | 5 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4993.034 | 299.5523 | 18.03 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.207 | 202] 1.5 [DL + RSX] | 5236.2312 | 228.9295 | -980.3878 |
| Bottom | 1.82 | 202] 1.5 [DL + RSX] | 5296.4572 | -221.487 | 128.1981 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4166.5125 | -670.7638 | 376.1319 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4226.7385 | 248.3376 | 376.1047 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5236.2312 | -688.4242 | 15.03 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5296.4572 | -19.2617 | 10.52 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5296.4572 | 128.1981 | 11.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.782 | 202] 1.5 [DL + RSX] | 5529.2972 | 201.3683 | 123.6112 |
| Bottom | 1.797 | 202] 1.5 [DL + RSX] | 5589.5231 | -206.7991 | 69.8475 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4412.032 | 186.1832 | -77.6611 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4472.2579 | 208.1134 | -78.0557 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5544.3468 | -27.7102 | 11.06 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5544.3468 | 186.1832 | 12.16 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5604.5728 | -194.8231 | 12.34 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5604.5728 | 208.1134 | 12.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.821 | 202] 1.5 [DL + RSX] | 5830.1995 | 201.2242 | 71.888 |
| Bottom | 1.84 | 202] 1.5 [DL + RSX] | 5890.4255 | -204.0066 | -63.6404 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4663.4644 | 136.9163 | -64.1672 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4723.6903 | 202.6999 | -64.7242 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5892.5068 | -81.3663 | 12.12 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5892.5068 | 136.9163 | 12.5 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5952.7328 | -213.6559 | 13.15 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5952.7328 | 202.6999 | 13.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.846 | 202] 1.5 [DL + RSX] | 6139.2748 | 194.1162 | 54.1933 |
| Bottom | 1.874 | 202] 1.5 [DL + RSX] | 6199.5008 | -198.2666 | 58.2759 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4922.0165 | 114.4149 | -56.137 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4982.2424 | 218.7808 | -56.8137 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6248.2569 | -95.5254 | 12.91 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6248.2569 | 114.4149 | 13.04 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6308.4829 | -218.2462 | 13.88 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6308.4829 | 218.7808 | 13.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.875 | 202] 1.5 [DL + RSX] | 6457.0368 | 186.3448 | 50.4313 |
| Bottom | 1.91 | 202] 1.5 [DL + RSX] | 6517.2627 | -191.4461 | 66.85 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5188.6721 | 107.5036 | -52.851 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5248.8981 | 236.5847 | -53.6 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6611.6555 | -91.7524 | 13.6 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6611.6555 | 107.5036 | 13.71 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6671.8814 | -227.3058 | 14.66 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6671.8814 | 236.5847 | 14.72 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.908 | 202] 1.5 [DL + RSX] | 6783.9448 | 177.0028 | 43.6394 |
| Bottom | 1.944 | 202] 1.5 [DL + RSX] | 6844.1708 | -183.1929 | 80.9356 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5464.5832 | 103.934 | 50.9942 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5524.8091 | 258.6546 | 51.7596 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6982.4938 | -94.7879 | 14.35 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6982.4938 | 103.934 | 14.41 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7042.7197 | -239.9613 | 15.47 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7042.7197 | 258.6546 | 15.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.946 | 202] 1.5 [DL + RSX] | 7120.5984 | 166.0293 | 38.5305 |
| Bottom | 1.993 | 202] 1.5 [DL + RSX] | 7180.8244 | -173.88 | 103.2727 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5751.3113 | 111.4919 | 52.1483 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5811.5373 | 287.9209 | 52.8613 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7360.5055 | -109.3113 | 15.19 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7360.5055 | 111.4919 | 15.2 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7420.7314 | -256.2079 | 16.32 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7420.7314 | 287.9209 | 16.54 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.98 | 202] 1.5 [DL + RSX] | 7467.5817 | 151.8406 | -45.4215 |
| Bottom | 2.033 | 202] 1.5 [DL + RSX] | 7527.8076 | -160.0836 | 130.3567 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6050.8083 | 136.0903 | 51.2159 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6111.0342 | 319.1679 | 51.8172 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7745.2268 | -138.4595 | 16.14 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7745.2268 | 136.0903 | 16.13 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7805.4527 | -285.6036 | 17.28 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7805.4527 | 319.1679 | 17.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.027 | 202] 1.5 [DL + RSX] | 7824.8818 | 138.7622 | -77.6615 |
| Bottom | 2.112 | 202] 1.5 [DL + RSX] | 7887.0197 | -159.3533 | 160.0895 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6364.7363 | 170.9427 | 45.8365 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6426.8742 | 344.364 | 46.3064 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8135.6898 | -190.1169 | 17.27 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8135.6898 | 170.9427 | 17.14 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8197.8277 | -311.0826 | 18.23 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8197.8277 | 344.364 | 18.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.616 | 202] 1.5 [DL + RSX] | 8217.5209 | 317.4946 | -123.5942 |
| Bottom | 2.681 | 202] 1.5 [DL + RSX] | 8297.8222 | 319.8555 | 281.9369 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6719.6485 | 201.5532 | 55.5739 | 216.648 | 584.735 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6799.9498 | 462.0396 | 55.8658 | 216.648 | 584.735 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8555.4527 | -248.6589 | 18.5 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8555.4527 | 201.5532 | 18.17 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8635.754 | -383.3909 | 19.59 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8635.754 | 462.0396 | 20.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P24 | 5045 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 5045 | 20524 | 5045 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.627 | 203] 1.5 [DL + RSY] | 9048.9732 | 259.1124 | -366.0999 |
| Bottom | 2.711 | 203] 1.5 [DL + RSY] | 9125.833 | -261.1826 | 600.1732 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7203.4016 | 276.1063 | 78.2746 | 224.1017 | 592.1887 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7280.2614 | 600.1732 | 78.3241 | 224.1017 | 592.1887 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9048.9732 | -366.0999 | 20.28 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9048.9732 | 276.1063 | 19.65 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9125.833 | -520.5255 | 21.5 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9125.833 | 600.1732 | 22.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 9.306 | 202] 1.5 [DL + RSX] | 101.726 | 283.9449 | 221.6914 |
| Bottom | 5.508 | 202] 1.5 [DL + RSX] | 388.9959 | 191.3989 | 655.8282 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 199.3783 | 429.4997 | 146.9955 | 412.3627 | 1677.9323 |
| Bottom | Leg 1 | 750 | 205] 1.2 [DL + LL + RSY] | 429.1943 | 702.3621 | 164.3369 | 418.7608 | 1684.3303 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 371.0171 | -187.8464 | 0.32 | 5 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 371.0171 | 429.4997 | 0.46 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 364.248 | -75.5371 | 0.25 | 5 |
| Botttom–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 600.8331 | 702.3621 | 0.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.688 | 202] 1.5 [DL + RSX] | 359.7379 | 102.3616 | 733.229 |
| Bottom | 5.369 | 202] 1.5 [DL + RSX] | 525.2985 | -190.1806 | 1183.5637 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 249.7411 | 1007.3092 | 238.7652 | 413.7648 | 1679.3344 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 460.5856 | 1336.0122 | 248.3062 | 419.6347 | 1685.2043 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 749.5937 | -13.1562 | 0.44 | 5 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 749.5937 | 952.405 | 0.99 | 5 |
| Bottom–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 648.8598 | -206.5587 | 0.49 | 5 |
| Botttom–Right | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 928.7719 | 1349.245 | 1.32 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.567 | 202] 1.5 [DL + RSX] | 591.834 | 203.3305 | 1174.3452 |
| Bottom | 6.856 | 202] 1.5 [DL + RSX] | 774.0042 | -256.5215 | 1383.0077 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 427.5682 | 1707.016 | 170.6151 | 418.7155 | 1684.2851 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 657.3944 | 1931.0863 | 179.7666 | 425.1139 | 1690.6834 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1197.5597 | -375.9343 | 0.9 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1197.5597 | 1707.016 | 1.68 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1429.1419 | -211.2745 | 0.94 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1429.1419 | 1931.0863 | 1.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 7.202 | 206] [0.9 DL + 1.5 RSX] | 502.9606 | 246.6309 | 996.709 |
| Bottom | 6.864 | 206] [0.9 DL + 1.5 RSX] | 586.2234 | -245.1341 | 1005.9538 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 808.8109 | 2362.5983 | 241.0812 | 429.3293 | 1694.8989 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1039.2147 | 2434.436 | 248.2408 | 435.7437 | 1701.3133 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1837.8878 | -905.7191 | 1.58 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1837.8878 | 2362.5983 | 2.43 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2068.0685 | -773.5238 | 1.63 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2068.0685 | 2434.436 | 2.6 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.542 | 206] [0.9 DL + 1.5 RSX] | 753.3213 | 253.1589 | 1005.456 |
| Bottom | 5.975 | 206] [0.9 DL + 1.5 RSX] | 835.2629 | -246.8956 | 911.8914 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1223.8301 | 2925.0919 | -333.6589 | 440.8834 | 1706.453 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1458.0031 | 2851.9119 | -339.2811 | 447.4028 | 1712.9724 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2529.3969 | -1382.6993 | 2.25 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2529.3969 | 2925.0919 | 3.15 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2762.6389 | -1338.9435 | 2.36 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2762.6389 | 2851.9119 | 3.25 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.027 | 206] [0.9 DL + 1.5 RSX] | 997.5749 | 265.7688 | 901.9095 |
| Bottom | 5.427 | 206] [0.9 DL + 1.5 RSX] | 1074.8007 | -257.562 | 829.9881 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1634.5717 | 3282.545 | -417.244 | 452.3185 | 1717.888 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1869.2298 | 3251.4577 | -421.0289 | 458.8514 | 1724.4209 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3222.4089 | -1857.8715 | 2.93 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3222.4089 | 3282.545 | 3.76 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3456.2942 | -1907.0684 | 3.09 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3456.2942 | 3251.4577 | 3.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.334 | 206] [0.9 DL + 1.5 RSX] | 1232.0035 | 272.1874 | 793.0888 |
| Bottom | 4.936 | 206] [0.9 DL + 1.5 RSX] | 1305.0115 | -268.195 | 783.5515 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2034.5019 | 3603.6119 | -468.7414 | 463.4525 | 1729.0221 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2269.3781 | 3686.292 | -471.0699 | 469.9915 | 1735.5611 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3918.3703 | -2319.6094 | 3.59 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3918.3703 | 3603.6119 | 4.34 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4152.6459 | -2470.0476 | 3.81 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4152.6459 | 3686.292 | 4.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.622 | 206] [0.9 DL + 1.5 RSX] | 1458.0778 | 276.1346 | 729.3678 |
| Bottom | 5.078 | 206] [0.9 DL + 1.5 RSX] | 1529.3935 | -296.7809 | 752.4653 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2425.0355 | 3950.7423 | -504.6759 | 474.325 | 1739.8946 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2660.0215 | 4124.2765 | -506.0407 | 480.867 | 1746.4366 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4616.4713 | -2771.3295 | 4.26 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4616.4713 | 3950.7423 | 4.95 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4850.9757 | -3012.7463 | 4.53 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 4850.9757 | 4124.2765 | 5.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.35 | 207] [0.9 DL + 1.5 RSY] | 1179.9087 | 136.8743 | 4048.4341 |
| Bottom | 3.115 | 207] [0.9 DL + 1.5 RSY] | 1321.054 | -139.7717 | 4277.1762 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2808.1435 | 4240.0858 | 403.2327 | 484.9907 | 1750.5603 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3043.2827 | 4502.2777 | 404.2359 | 491.537 | 1757.1066 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 5333.0308 | -3281.8273 | 4.96 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5333.0308 | 4240.0858 | 5.52 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5567.8609 | -3376.7704 | 5.15 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5567.8609 | 4502.2777 | 5.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.795 | 207] [0.9 DL + 1.5 RSY] | 1338.5792 | 129.2645 | 4407.33 |
| Bottom | 2.739 | 207] [0.9 DL + 1.5 RSY] | 1479.7634 | -139.94 | 4524.9812 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3188.3256 | 4594.3809 | -411.077 | 495.575 | 1761.1445 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3423.5349 | 4712.0764 | -411.9881 | 502.1232 | 1767.6928 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6060.4062 | -3659.1264 | 5.6 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6060.4062 | 4594.3809 | 6.15 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6295.3224 | -3776.6008 | 5.8 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6295.3224 | 4712.0764 | 6.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.345 | 207] [0.9 DL + 1.5 RSY] | 1490.9213 | 126.0145 | 4678.7224 |
| Bottom | 2.355 | 207] [0.9 DL + 1.5 RSY] | 1632.0536 | -140.2393 | 4672.8158 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3560.5508 | 4832.2017 | -420.9591 | 505.9377 | 1771.5073 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3795.6912 | 4830.3741 | -422.4999 | 512.484 | 1778.0536 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6787.5966 | -4064.8051 | 6.25 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6787.5966 | 4832.2017 | 6.7 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7022.4969 | -4042.5826 | 6.37 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7022.4969 | 4830.3741 | 6.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.149 | 207] [0.9 DL + 1.5 RSY] | 1636.8179 | 122.7908 | 4851.3346 |
| Bottom | 2.19 | 207] [0.9 DL + 1.5 RSY] | 1777.8514 | -139.0115 | 4715.816 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3925.1407 | 4977.7209 | -443.8658 | 516.0879 | 1781.6575 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4160.1412 | 4852.9047 | -446.2117 | 522.6303 | 1788.1999 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7516.4737 | -4345.7893 | 6.83 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7516.4737 | 4977.7209 | 7.2 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7751.3079 | -4167.4612 | 6.86 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7751.3079 | 4852.9047 | 7.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.985 | 207] [0.9 DL + 1.5 RSY] | 1775.3763 | 120.2851 | 4912.3758 |
| Bottom | 1.981 | 207] [0.9 DL + 1.5 RSY] | 1916.2879 | -136.7548 | 4670.5135 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4281.1476 | 5020.4806 | -478.1774 | 525.9991 | 1791.5687 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4515.9737 | 4793.6391 | -481.1169 | 532.5367 | 1798.1063 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8247.7087 | -4479.9566 | 7.33 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8247.7087 | 5020.4806 | 7.64 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8482.4553 | -4178.0114 | 7.28 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8482.4553 | 4793.6391 | 7.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.787 | 207] [0.9 DL + 1.5 RSY] | 1905.7732 | 117.8553 | 4869.6445 |
| Bottom | 1.751 | 207] [0.9 DL + 1.5 RSY] | 2046.5536 | -134.0114 | 4572.3663 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4627.7418 | 4965.6059 | -519.0558 | 535.6483 | 1801.2179 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4862.3789 | 4685.3306 | -522.2023 | 542.1806 | 1807.7502 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8982.1013 | -4485.7986 | 7.75 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8982.1013 | 4965.6059 | 8.03 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9216.7474 | -4120.5089 | 7.67 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9216.7474 | 4685.3306 | 8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.561 | 207] [0.9 DL + 1.5 RSY] | 2027.2993 | 115.0075 | 4749.8099 |
| Bottom | 1.526 | 207] [0.9 DL + 1.5 RSY] | 2167.9539 | -131.0311 | 4473.5703 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4964.1797 | 4837.1723 | -561.257 | 545.0148 | 1810.5843 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5198.6321 | 4578.5508 | -564.2176 | 551.5419 | 1817.1115 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9720.2223 | -4400.3604 | 8.12 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9720.2223 | 4837.1723 | 8.38 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9954.7586 | -4053.6485 | 8.05 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9954.7586 | 4578.5508 | 8.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.322 | 207] [0.9 DL + 1.5 RSY] | 2139.529 | 111.6391 | 4596.3483 |
| Bottom | 1.335 | 207] [0.9 DL + 1.5 RSY] | 2280.0765 | -127.8171 | 4433.693 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5289.9924 | 4677.0733 | -600.1752 | 554.0854 | 1819.655 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5524.2811 | 4532.4916 | -602.6609 | 560.608 | 1826.1776 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10462.3245 | -4273.4482 | 8.47 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10462.3245 | 4677.0733 | 8.7 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10696.742 | -4038.4984 | 8.46 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10696.742 | 4532.4916 | 8.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.097 | 207] [0.9 DL + 1.5 RSY] | 2242.444 | 107.9185 | 4463.6843 |
| Bottom | 1.198 | 207] [0.9 DL + 1.5 RSY] | 2382.9151 | -124.137 | 4504.0557 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5605.1107 | 4539.3865 | -632.1141 | 562.8583 | 1828.4278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5839.2722 | 4599.7752 | -633.9957 | 569.3773 | 1834.9469 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11208.223 | -4160.8757 | 8.83 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11208.223 | 4539.3865 | 9.05 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11442.5131 | -4121.1779 | 8.94 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11442.5131 | 4599.7752 | 9.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.017 | 203] 1.5 [DL + RSY] | 11957.2339 | 146.5821 | 4480.2032 |
| Bottom | 1.114 | 207] [0.9 DL + 1.5 RSY] | 2476.9619 | -119.1224 | 4712.3184 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5909.965 | 4480.2032 | 653.5208 | 571.3454 | 1836.915 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6144.0503 | 4812.5617 | 654.87 | 577.8624 | 1843.4319 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11957.2339 | -4112.1615 | 9.23 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11957.2339 | 4480.2032 | 9.44 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12191.3917 | -4311.3454 | 9.48 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12191.3917 | 4812.5617 | 9.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.059 | 203] 1.5 [DL + RSY] | 12708.0426 | 142.3572 | 4546.1798 |
| Bottom | 1.108 | 203] 1.5 [DL + RSY] | 12942.0517 | -155.2662 | 5142.5598 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6205.4346 | 4546.1798 | 673.2772 | 579.5713 | 1845.1409 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6439.502 | 5142.5598 | 674.3154 | 586.0877 | 1851.6573 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12708.0426 | -4150.8047 | 9.68 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12708.0426 | 4546.1798 | 9.91 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12942.0517 | -4589.0303 | 10.07 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12942.0517 | 5142.5598 | 10.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.111 | 203] 1.5 [DL + RSY] | 13458.4829 | 143.5591 | 4729.5371 |
| Bottom | 1.15 | 203] 1.5 [DL + RSY] | 13692.3423 | -143.8007 | 5432.4487 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6492.6139 | 4729.5371 | -668.6151 | 587.5664 | 1853.1359 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6726.7297 | 5432.4487 | -669.8192 | 594.0842 | 1859.6537 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13458.4829 | -4276.3441 | 10.18 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13458.4829 | 4729.5371 | 10.44 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13692.3423 | -4900.4089 | 10.68 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13692.3423 | 5432.4487 | 10.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.163 | 203] 1.5 [DL + RSY] | 14210.174 | 145.1023 | 4892.5383 |
| Bottom | 1.207 | 203] 1.5 [DL + RSY] | 14444.0021 | -152.3321 | 5540.5966 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6774.6168 | 4892.5383 | -614.6071 | 595.4173 | 1860.9869 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7008.8331 | 5540.5966 | -616.3751 | 601.9379 | 1867.5075 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14210.174 | -4454.36 | 10.71 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14210.174 | 4892.5383 | 10.97 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14444.0021 | -5089.3322 | 11.22 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14444.0021 | 5540.5966 | 11.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.195 | 203] 1.5 [DL + RSY] | 14959.663 | 122.7015 | 4910.9798 |
| Bottom | 1.253 | 203] 1.5 [DL + RSY] | 15193.0128 | -146.9111 | 5744.9677 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7054.1707 | 4910.9798 | -615.1068 | 603.2001 | 1868.7697 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7288.0988 | 5744.9677 | -617.2519 | 609.7127 | 1875.2822 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14959.663 | -4564.11 | 11.2 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14959.663 | 4910.9798 | 11.41 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15193.0128 | -5312.6946 | 11.77 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15193.0128 | 5744.9677 | 12.03 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.23 | 203] 1.5 [DL + RSY] | 15706.9847 | 117.4326 | 5024.9756 |
| Bottom | 1.288 | 203] 1.5 [DL + RSY] | 15940.1275 | -142.6043 | 6058.2744 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7333.0526 | 5024.9756 | 643.7348 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7566.8498 | 6058.2744 | 646.4911 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15706.9847 | -4707.3619 | 11.71 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15706.9847 | 5024.9756 | 11.9 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15940.1275 | -5568.2992 | 12.35 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15940.1275 | 6058.2744 | 12.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.278 | 203] 1.5 [DL + RSY] | 16450.648 | 110.9612 | 5240.6712 |
| Bottom | 1.342 | 203] 1.5 [DL + RSY] | 16683.6284 | -138.1716 | 6458.124 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7613.5025 | 5240.6712 | 679.5658 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7847.1516 | 6458.124 | 682.8909 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16450.648 | -4878.5774 | 12.24 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16450.648 | 5240.6712 | 12.45 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16683.6284 | -5946.8682 | 13 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16683.6284 | 6458.124 | 13.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.327 | 203] 1.5 [DL + RSY] | 17188.0649 | 103.432 | 5544.6853 |
| Bottom | 1.398 | 203] 1.5 [DL + RSY] | 17420.9067 | -132.3606 | 7014.3643 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7897.7736 | 5544.6853 | -725.8779 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8131.2604 | 7014.3643 | -729.4984 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17188.0649 | -5174.4825 | 12.83 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17188.0649 | 5544.6853 | 13.05 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17420.9067 | -6527.4617 | 13.76 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17420.9067 | 7014.3643 | 14.04 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.38 | 203] 1.5 [DL + RSY] | 17916.0446 | 95.8378 | 6025.0226 |
| Bottom | 1.459 | 203] 1.5 [DL + RSY] | 18148.7783 | -125.2066 | 7799.4006 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8189.0646 | 6025.0226 | -783.8661 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8422.3822 | 7799.4006 | -787.4238 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17916.0446 | -5693.6345 | 13.55 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17916.0446 | 6025.0226 | 13.74 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18148.7783 | -7388.4541 | 14.68 | 5 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18148.7783 | 7799.4006 | 14.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.413 | 203] 1.5 [DL + RSY] | 18630.5657 | 87.9082 | 6776.0977 |
| Bottom | 1.499 | 203] 1.5 [DL + RSY] | 18863.2209 | -116.2587 | 8855.3226 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8491.5769 | 6776.0977 | -842.3632 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8724.7204 | 8855.3226 | -845.5189 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18630.5657 | -6537.2784 | 14.45 | 5 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18630.5657 | 6776.0977 | 14.59 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18863.2209 | -8589.1624 | 15.79 | 5 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 18863.2209 | 8855.3226 | 15.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.476 | 203] 1.5 [DL + RSY] | 19326.6134 | 80.1269 | 7853.4459 |
| Bottom | 1.572 | 203] 1.5 [DL + RSY] | 19559.1711 | -103.5594 | 10221.1672 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8810.6607 | 7853.4459 | -893.9857 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9043.5937 | 10221.1672 | -896.4852 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19326.6134 | -7778.8782 | 15.58 | 5 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19326.6134 | 7853.4459 | 15.62 | 5 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19559.1711 | -10149.4666 | 17.1 | 5 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19559.1711 | 10221.1672 | 17.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.55 | 203] 1.5 [DL + RSY] | 19997.7286 | 73.5741 | -9442.3041 |
| Bottom | 1.703 | 207] [0.9 DL + 1.5 RSY] | 3466.5947 | -52.1862 | 12131.8058 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9153.0675 | 9297.8475 | 934.5257 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9392.5065 | 12134.6116 | 936.3244 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19997.7286 | -9442.3041 | 16.93 | 5 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19997.7286 | 9297.8475 | 16.85 | 5 |
| Bottom–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20237.0524 | -12120.5829 | 18.64 | 5 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20237.0524 | 12134.6116 | 18.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.349 | 203] 1.5 [DL + RSY] | 20731.9075 | 634.4887 | 11632.616 |
| Bottom | 3.049 | 207] [0.9 DL + 1.5 RSY] | 3748.0181 | -126.3203 | 15360.1219 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9641.7587 | 11632.616 | -1033.3632 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9943.4535 | 15404.319 | -1034.4708 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20731.9075 | -11142.1768 | 18.35 | 5 |
| Top–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20731.9075 | 11632.616 | 18.63 | 5 |
| Bottom–Left | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 21033.7235 | -15183.3336 | 20.88 | 5 |
| Botttom–Right | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 21033.7235 | 15404.319 | 21.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P25 | 12305 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 12305 | 19655 | 12305 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.847 | 207] [0.9 DL + 1.5 RSY] | 3879.0146 | 123.7562 | 15104.1653 |
| Bottom | 4.008 | 207] [0.9 DL + 1.5 RSY] | 4052.8697 | 128.4388 | 18838.3763 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10206.9814 | 15261.6763 | 984.6932 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10496.7738 | 19138.4021 | 984.8867 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 21432.8524 | -14474.1211 | 20.7 | 5 |
| Top–Right | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 21432.8524 | 15261.6763 | 21.16 | 5 |
| Bottom–Left | Leg 1 | 2250 | 203] 1.5 [DL + RSY] | 21722.7469 | -17638.2732 | 22.71 | 5 |
| Botttom–Right | Leg 1 | 2250 | 203] 1.5 [DL + RSY] | 21722.7469 | 19138.4021 | 23.59 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 10.279 | 202] 1.5 [DL + RSX] | 87.703 | -310.7059 | 260.4658 |
| Bottom | 7.97 | 202] 1.5 [DL + RSX] | 374.973 | 271.2845 | -294.8274 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 19.8218 | 576.4206 | -144.1957 | 407.3638 | 1672.9334 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 307.0918 | 287.4891 | -166.699 | 415.3614 | 1680.931 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 307.141 | -51.1775 | 0.21 | 5 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 307.141 | 590.2442 | 0.52 | 5 |
| Bottom–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 536.9569 | -43.1142 | 0.33 | 5 |
| Botttom–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 536.9569 | 425.3657 | 0.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 7.051 | 202] 1.5 [DL + RSX] | 451.8233 | -244.062 | 658.6483 |
| Bottom | 7.709 | 202] 1.5 [DL + RSX] | 627.9444 | 282.7593 | 637.4219 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 324.0286 | 916.1706 | -292.1898 | 415.833 | 1681.4025 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 552.2404 | 717.6156 | -302.9765 | 422.1864 | 1687.7559 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 840.767 | -4.8064 | 0.48 | 5 |
| Top–Right | Leg 1 | 0 | 205] 1.2 [DL + LL + RSY] | 840.767 | 939.2488 | 1.03 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1036.8044 | -433.1619 | 0.84 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1036.8044 | 717.6156 | 1.01 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.754 | 202] 1.5 [DL + RSX] | 848.3853 | -275.9558 | 708.4835 |
| Bottom | 5.466 | 206] [0.9 DL + 1.5 RSX] | 523.5389 | 205.3957 | 606.4044 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 674.4022 | 1079.7728 | -154.4382 | 425.5874 | 1691.1569 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 916.4355 | 1022.0538 | -164.1984 | 432.3256 | 1697.8951 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1438.4652 | -751.8275 | 1.26 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1438.4652 | 1079.7728 | 1.45 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1678.8241 | -794.6383 | 1.42 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1678.8241 | 1022.0538 | 1.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.896 | 206] [0.9 DL + 1.5 RSX] | 654.4069 | -260.9737 | 650.9976 |
| Bottom | 6.408 | 206] [0.9 DL + 1.5 RSX] | 737.9217 | 254.3742 | 689.5711 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1043.1461 | 1495 | 269.2522 | 435.8532 | 1701.4228 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1271.484 | 1768.6731 | 276.5439 | 442.2101 | 1707.7797 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2061.8568 | -1366.4269 | 1.98 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2061.8568 | 1495 | 2.05 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2290.4402 | -1142.4229 | 1.97 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2290.4402 | 1768.6731 | 2.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 6.149 | 206] [0.9 DL + 1.5 RSX] | 890.8955 | -261.1758 | 763.5178 |
| Bottom | 5.545 | 206] [0.9 DL + 1.5 RSX] | 972.84 | 252.9646 | 708.1273 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1433.3331 | 2318.6112 | 309.739 | 446.716 | 1712.2856 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1664.4813 | 2464.0728 | 315.2235 | 453.1512 | 1718.7207 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2726.9717 | -1667.3187 | 2.53 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2726.9717 | 2318.6112 | 2.91 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2959.0617 | -1556.9407 | 2.6 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 2959.0617 | 2464.0728 | 3.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.812 | 206] [0.9 DL + 1.5 RSX] | 1123.6197 | -275.6868 | 761.8484 |
| Bottom | 5.125 | 206] [0.9 DL + 1.5 RSX] | 1200.0743 | 264.7632 | 690.8634 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1822.7878 | 2954.6613 | -381.2134 | 457.5584 | 1723.128 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2053.4529 | 3031.8068 | -385.1451 | 463.9801 | 1729.5497 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3396.7913 | -2015.1768 | 3.12 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3396.7913 | 2954.6613 | 3.67 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3628.2359 | -2040.3525 | 3.26 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 3628.2359 | 3031.8068 | 3.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 5.182 | 206] [0.9 DL + 1.5 RSX] | 1347.485 | -281.4898 | 716.3415 |
| Bottom | 4.71 | 206] [0.9 DL + 1.5 RSX] | 1419.2894 | 275.7867 | 677.9008 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2202.9405 | 3445.2182 | -458.2655 | 468.1419 | 1733.7114 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2433.3879 | 3553.9908 | -460.7058 | 474.5575 | 1740.1271 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4070.282 | -2403.107 | 3.73 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4070.282 | 3445.2182 | 4.34 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4301.3359 | -2563.5063 | 3.95 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4301.3359 | 3553.9908 | 4.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 4.519 | 206] [0.9 DL + 1.5 RSX] | 1563.9059 | -285.1151 | 689.2367 |
| Bottom | 4.926 | 206] [0.9 DL + 1.5 RSX] | 1633.7261 | 305.0564 | 669.8594 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2574.8319 | 3878.1443 | -509.2751 | 478.4953 | 1744.0649 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2805.1697 | 4031.5239 | -510.7267 | 484.9079 | 1750.4775 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4746.8593 | -2820.5375 | 4.36 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4746.8593 | 3878.1443 | 4.98 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 4977.6842 | -3096.0832 | 4.65 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 4977.6842 | 4031.5239 | 5.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 3.379 | 207] [0.9 DL + 1.5 RSY] | 1264.9912 | -147.1469 | 4027.9435 |
| Bottom | 3.11 | 207] [0.9 DL + 1.5 RSY] | 1403.0414 | 149.1843 | 4235.4425 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2942.4443 | 4203.969 | -400.797 | 488.7297 | 1754.2992 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3172.6313 | 4431.4448 | -401.7798 | 495.1381 | 1760.7076 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5444.8213 | -3323.8413 | 5.05 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5444.8213 | 4203.969 | 5.57 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5675.3181 | -3451.4332 | 5.26 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5675.3181 | 4431.4448 | 5.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.861 | 207] [0.9 DL + 1.5 RSY] | 1415.5245 | -139.5143 | 4399.1483 |
| Bottom | 2.786 | 207] [0.9 DL + 1.5 RSY] | 1553.5368 | 149.7183 | 4497.2202 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3308.1597 | 4575.1337 | -416.581 | 498.9112 | 1764.4807 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3538.2775 | 4662.3873 | -417.5269 | 505.3176 | 1770.8872 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6155.0164 | -3695.2066 | 5.67 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6155.0164 | 4575.1337 | 6.19 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6385.4263 | -3836.5516 | 5.89 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6385.4263 | 4662.3873 | 6.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.435 | 207] [0.9 DL + 1.5 RSY] | 1560.129 | -135.9049 | 4682.4004 |
| Bottom | 2.429 | 207] [0.9 DL + 1.5 RSY] | 1698.1938 | 149.9981 | 4654.0702 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3666.7273 | 4830.8803 | -426.7981 | 508.8937 | 1774.4633 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3896.9146 | 4796.0684 | -428.3955 | 515.3021 | 1780.8717 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6866.2642 | -4088.481 | 6.31 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6866.2642 | 4830.8803 | 6.74 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7096.6894 | -4086.0776 | 6.44 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7096.6894 | 4796.0684 | 6.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.235 | 207] [0.9 DL + 1.5 RSY] | 1698.7479 | -132.3197 | 4861.9477 |
| Bottom | 2.268 | 207] [0.9 DL + 1.5 RSY] | 1836.9118 | 148.5919 | 4699.2943 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4018.5399 | 4988.6496 | -451.9372 | 518.6882 | 1784.2577 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4248.8676 | 4824.5824 | -454.3499 | 525.1005 | 1790.67 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7580.4204 | -4355.14 | 6.87 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7580.4204 | 4988.6496 | 7.24 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7810.9112 | -4198.1421 | 6.91 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7810.9112 | 4824.5824 | 7.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.07 | 207] [0.9 DL + 1.5 RSY] | 1830.5246 | -129.4424 | 4923.0494 |
| Bottom | 2.06 | 207] [0.9 DL + 1.5 RSY] | 1968.8107 | 146.0915 | 4652.842 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4362.6807 | 5034.2523 | -487.9541 | 528.269 | 1793.8386 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4593.1828 | 4766.1869 | -490.9527 | 534.6862 | 1800.2558 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8298.0998 | -4478.2377 | 7.35 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8298.0998 | 5034.2523 | 7.68 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8528.678 | -4199.4622 | 7.32 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 8528.678 | 4766.1869 | 7.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.87 | 207] [0.9 DL + 1.5 RSY] | 1954.6627 | -126.6164 | 4876.7033 |
| Bottom | 1.83 | 207] [0.9 DL + 1.5 RSY] | 2093.08 | 143.084 | 4553.8936 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4698.3353 | 4976.8399 | -529.8114 | 537.6137 | 1803.1832 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4929.0266 | 4658.0466 | -532.996 | 544.0361 | 1809.6057 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9020.0278 | -4476.1569 | 7.76 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9020.0278 | 4976.8399 | 8.06 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9250.7066 | -4137.2816 | 7.7 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9250.7066 | 4658.0466 | 8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.641 | 207] [0.9 DL + 1.5 RSY] | 2070.4827 | -123.369 | 4753.0791 |
| Bottom | 1.607 | 207] [0.9 DL + 1.5 RSY] | 2209.0256 | 139.8496 | 4457.5707 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5024.7805 | 4844.6468 | -572.2361 | 546.7019 | 1812.2715 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5255.6564 | 4553.9911 | -575.2097 | 553.1295 | 1818.699 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9746.7088 | -4386.8083 | 8.13 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9746.7088 | 4844.6468 | 8.39 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9977.4973 | -4071.8893 | 8.07 | 5 |
| Botttom–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 9977.4973 | 4553.9911 | 8.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.399 | 207] [0.9 DL + 1.5 RSY] | 2177.5818 | -119.6195 | 4598.5877 |
| Bottom | 1.419 | 207] [0.9 DL + 1.5 RSY] | 2316.2317 | 136.3893 | 4424.4579 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5341.5604 | 4682.8194 | -610.675 | 555.521 | 1821.0906 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5572.5997 | 4514.3713 | -613.1527 | 561.9532 | 1827.5227 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10478.3326 | -4261.6609 | 8.47 | 5 |
| Top–Right | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10478.3326 | 4682.8194 | 8.72 | 5 |
| Bottom–Left | Leg 1 | 900 | 203] 1.5 [DL + RSY] | 10709.2402 | -4064.8043 | 8.49 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 10709.2402 | 4514.3713 | 8.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.174 | 207] [0.9 DL + 1.5 RSY] | 2275.955 | -115.5685 | 4469.1489 |
| Bottom | 1.285 | 207] [0.9 DL + 1.5 RSY] | 2414.6812 | 132.4449 | 4503.9686 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5648.6087 | 4547.0614 | -641.6868 | 564.0693 | 1829.6388 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5879.7752 | 4589.9064 | -643.5508 | 570.5049 | 1836.0745 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11214.6598 | -4157.4991 | 8.83 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11214.6598 | 4547.0614 | 9.06 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11445.6948 | -4160.2171 | 8.96 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11445.6948 | 4589.9064 | 9.21 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.029 | 203] 1.5 [DL + RSY] | 11954.9609 | -156.6173 | 4492.3936 |
| Bottom | 1.203 | 207] [0.9 DL + 1.5 RSY] | 2504.8436 | 127.1093 | 4719.504 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5946.344 | 4492.3936 | -661.6257 | 572.3582 | 1837.9278 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6177.5866 | 4808.3452 | -662.9421 | 578.796 | 1844.3656 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11954.9609 | -4122.7651 | 9.23 | 5 |
| Top–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 11954.9609 | 4492.3936 | 9.45 | 5 |
| Bottom–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12186.1283 | -4364.1393 | 9.5 | 5 |
| Botttom–Right | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12186.1283 | 4808.3452 | 9.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.07 | 203] 1.5 [DL + RSY] | 12697.8986 | -152.0655 | 4561.3901 |
| Bottom | 1.118 | 203] 1.5 [DL + RSY] | 12929.2146 | 165.4848 | 5138.0477 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6235.6216 | 4561.3901 | -672.1175 | 580.4117 | 1845.9813 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6466.8821 | 5138.0477 | -673.1432 | 586.85 | 1852.4196 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1050 | 203] 1.5 [DL + RSY] | 12697.8986 | -4177.7852 | 9.69 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12697.8986 | 4561.3901 | 9.91 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12929.2146 | -4651.7982 | 10.1 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 12929.2146 | 5138.0477 | 10.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.12 | 203] 1.5 [DL + RSY] | 13441.2612 | -152.904 | 4742.3684 |
| Bottom | 1.158 | 203] 1.5 [DL + RSY] | 13672.7269 | 152.0168 | 5432.3137 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6517.4901 | 4742.3684 | -670.7896 | 588.2589 | 1853.8285 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6748.7023 | 5432.3137 | -671.9999 | 594.6959 | 1860.2654 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13441.2612 | -4316.9419 | 10.19 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13441.2612 | 4742.3684 | 10.44 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13672.7269 | -4954.8699 | 10.7 | 5 |
| Botttom–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 13672.7269 | 5432.3137 | 10.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.17 | 203] 1.5 [DL + RSY] | 14185.2998 | -153.5835 | 4905.4667 |
| Bottom | 1.216 | 203] 1.5 [DL + RSY] | 14416.7969 | 161.1725 | 5561.1283 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6794.05 | 4905.4667 | -608.1591 | 595.9584 | 1861.5279 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7025.1616 | 5561.1283 | -609.9686 | 602.3925 | 1867.9621 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14185.2998 | -4492.8705 | 10.72 | 5 |
| Top–Right | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14185.2998 | 4905.4667 | 10.96 | 5 |
| Bottom–Left | Leg 1 | 1200 | 203] 1.5 [DL + RSY] | 14416.7969 | -5111.1968 | 11.21 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14416.7969 | 5561.1283 | 11.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.198 | 203] 1.5 [DL + RSY] | 14927.9047 | -128.4446 | 4943.0777 |
| Bottom | 1.259 | 203] 1.5 [DL + RSY] | 15159.8801 | 153.6783 | 5764.6931 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7068.3544 | 4943.0777 | -614.7318 | 603.595 | 1869.1646 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7299.7543 | 5764.6931 | -616.9317 | 610.0372 | 1875.6067 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14927.9047 | -4573.8831 | 11.19 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 14927.9047 | 4943.0777 | 11.41 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15159.8801 | -5321.373 | 11.76 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15159.8801 | 5764.6931 | 12.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.232 | 203] 1.5 [DL + RSY] | 15669.3672 | -122.9554 | 5053.9301 |
| Bottom | 1.292 | 203] 1.5 [DL + RSY] | 15901.5497 | 148.7328 | 6069.4577 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7342.9395 | 5053.9301 | 640.932 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7574.4702 | 6069.4577 | 643.7162 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15669.3672 | -4706.4636 | 11.69 | 5 |
| Top–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15669.3672 | 5053.9301 | 11.89 | 5 |
| Bottom–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15901.5497 | -5572.7876 | 12.33 | 5 |
| Botttom–Right | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 15901.5497 | 6069.4577 | 12.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.279 | 203] 1.5 [DL + RSY] | 16407.6027 | -115.2963 | 5258.7819 |
| Bottom | 1.344 | 203] 1.5 [DL + RSY] | 16639.9477 | 143.4142 | 6463.3053 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7619.6121 | 5258.7819 | 677.8592 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7851.2908 | 6463.3053 | 681.2062 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1350 | 203] 1.5 [DL + RSY] | 16407.6027 | -4875.021 | 12.21 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16407.6027 | 5258.7819 | 12.44 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16639.9477 | -5948.6055 | 12.97 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 16639.9477 | 6463.3053 | 13.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.327 | 203] 1.5 [DL + RSY] | 17139.9418 | -106.572 | 5554.0558 |
| Bottom | 1.399 | 203] 1.5 [DL + RSY] | 17372.4255 | 136.6363 | 7017.0209 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7900.5532 | 5554.0558 | -727.6924 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8132.394 | 7017.0209 | -731.3275 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17139.9418 | -5169.4692 | 12.8 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17139.9418 | 5554.0558 | 13.03 | 5 |
| Bottom–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17372.4255 | -6527.7765 | 13.73 | 5 |
| Botttom–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17372.4255 | 7017.0209 | 14.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.378 | 203] 1.5 [DL + RSY] | 17863.1433 | -97.7534 | 6029.1861 |
| Bottom | 1.459 | 203] 1.5 [DL + RSY] | 18095.7352 | 128.422 | 7801.6636 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8188.8863 | 6029.1861 | -785.5391 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8420.8962 | 7801.6636 | -789.1005 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17863.1433 | -5688.5925 | 13.52 | 5 |
| Top–Right | Leg 1 | 1500 | 203] 1.5 [DL + RSY] | 17863.1433 | 6029.1861 | 13.72 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18095.7352 | -7389.8361 | 14.65 | 5 |
| Botttom–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18095.7352 | 7801.6636 | 14.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.41 | 203] 1.5 [DL + RSY] | 18573.1199 | -88.6723 | 6777.5913 |
| Bottom | 1.498 | 203] 1.5 [DL + RSY] | 18805.7904 | 118.6401 | 8857.4619 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8488.7085 | 6777.5913 | -844.2315 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8720.8924 | 8857.4619 | -847.386 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18573.1199 | -6535.0421 | 14.42 | 5 |
| Top–Right | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18573.1199 | 6777.5913 | 14.56 | 5 |
| Bottom–Left | Leg 1 | 1650 | 203] 1.5 [DL + RSY] | 18805.7904 | -8594.9973 | 15.76 | 5 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 18805.7904 | 8857.4619 | 15.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.471 | 203] 1.5 [DL + RSY] | 19264.8466 | -79.1748 | 7852.5509 |
| Bottom | 1.568 | 203] 1.5 [DL + RSY] | 19497.6147 | 103.5034 | 10221.454 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8805.3069 | 7852.5509 | -896.764 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9037.7012 | 10221.454 | -899.2579 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19264.8466 | -7783.467 | 15.54 | 5 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19264.8466 | 7852.5509 | 15.58 | 5 |
| Bottom–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19497.6147 | -10164.9064 | 17.07 | 5 |
| Botttom–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19497.6147 | 10221.454 | 17.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.546 | 203] 1.5 [DL + RSY] | 19931.894 | -73.5611 | -9458.1235 |
| Bottom | 1.704 | 207] [0.9 DL + 1.5 RSY] | 3473.2077 | 55.5215 | -12148.5725 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9145.235 | 9294.2708 | 936.8644 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9384.2705 | 12139.1696 | 938.5447 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19931.894 | -9458.1235 | 16.9 | 5 |
| Top–Right | Leg 1 | 1800 | 203] 1.5 [DL + RSY] | 19931.894 | 9294.2708 | 16.81 | 5 |
| Bottom–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20171.0436 | -12150.9233 | 18.62 | 5 |
| Botttom–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20171.0436 | 12139.1696 | 18.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.28 | 203] 1.5 [DL + RSY] | 20669.2493 | -589.0477 | 11641.2682 |
| Bottom | 3.016 | 207] [0.9 DL + 1.5 RSY] | 3755.7002 | 121.6857 | 15377.1491 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9635.6479 | 11641.2682 | -1046.0672 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9937.3271 | 15404.0941 | -1047.212 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20669.2493 | -11172.4959 | 18.33 | 5 |
| Top–Right | Leg 1 | 1950 | 203] 1.5 [DL + RSY] | 20669.2493 | 11641.2682 | 18.6 | 5 |
| Bottom–Left | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 20970.8073 | -15269.3689 | 20.9 | 5 |
| Botttom–Right | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 20970.8073 | 15404.0941 | 20.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P26 | 15035 | 22577.5 | 5845 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |
| Bottom | Leg 1 | 15035 | 19655 | 15035 | 25500 | 5845 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.661 | 207] [0.9 DL + 1.5 RSY] | 3854.5504 | -93.2008 | 15171.1063 |
| Bottom | 3.918 | 207] [0.9 DL + 1.5 RSY] | 4028.5205 | 97.8865 | 18894.0564 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10154.1086 | 15353.6469 | 976.7994 | 610.218 | 1875.7876 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 10444.0248 | 19199.9005 | 977.0087 | 610.218 | 1875.7876 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 21343.6826 | -14440.9439 | 20.63 | 5 |
| Top–Right | Leg 1 | 2100 | 203] 1.5 [DL + RSY] | 21343.6826 | 15353.6469 | 21.16 | 5 |
| Bottom–Left | Leg 1 | 2250 | 203] 1.5 [DL + RSY] | 21633.4967 | -17670.6797 | 22.68 | 5 |
| Botttom–Right | Leg 1 | 2250 | 203] 1.5 [DL + RSY] | 21633.4967 | 19199.9005 | 23.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.309 | 206] [0.9 DL + 1.5 RSX] | 974.9774 | -147.873 | -211.7883 |
| Bottom | 1.899 | 206] [0.9 DL + 1.5 RSX] | 1002.6105 | 145.3417 | -40.9113 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1742.5346 | -214.4913 | 135.2176 | 150.7387 | 432.2169 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1788.5897 | 58.3795 | 135.5148 | 150.7387 | 432.2169 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1915.3136 | -272.0675 | 8.13 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1961.3687 | -47.8741 | 5.6 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1961.3687 | 13.06 | 5.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.914 | 206] [0.9 DL + 1.5 RSX] | 1064.8867 | -143.7244 | 102.459 |
| Bottom | 1.797 | 206] [0.9 DL + 1.5 RSX] | 1092.5198 | 143.0382 | -60.8503 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1981.4462 | 205.379 | -96.641 | 150.7387 | 432.2169 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2027.5014 | 16.7 | -97.1821 | 150.7387 | 432.2169 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 207] [0.9 DL + 1.5 RSY] | 1256.7105 | -36.1099 | 3.65 | 5 |
| Top–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2173.2701 | 144.7763 | 7.29 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2219.3252 | -38.0095 | 6.14 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2112.3049 | 16.7 | 5.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.808 | 206] [0.9 DL + 1.5 RSX] | 1158.8892 | -145.2406 | 79.5659 |
| Bottom | 1.712 | 206] [0.9 DL + 1.5 RSX] | 1186.5223 | 144.0192 | -55.9137 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2195.5254 | 164.033 | -81.1421 | 150.7387 | 432.2169 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2241.5806 | 26.9627 | -81.6645 | 150.7387 | 432.2169 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2299.1994 | -45.7438 | 6.44 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2436.8907 | 103.2238 | 7.47 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2482.9458 | -33.4088 | 6.76 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2345.2545 | 26.9627 | 6.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.766 | 202] 1.5 [DL + RSX] | 2704.6884 | -164.5698 | 109.6793 |
| Bottom | 1.726 | 202] 1.5 [DL + RSX] | 2750.7435 | 163.4778 | -76.18 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2392.2177 | 168.6563 | -81.7597 | 150.7387 | 432.2169 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2438.2729 | 31.8843 | -82.3089 | 150.7387 | 432.2169 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2558.0175 | -45.7893 | 7.1 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2704.6884 | 109.6793 | 8.23 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2750.7435 | -31.7701 | 7.43 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2604.0727 | 31.8843 | 7.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.665 | 202] 1.5 [DL + RSX] | 2976.9142 | -164.4024 | 110.1815 |
| Bottom | 1.645 | 202] 1.5 [DL + RSX] | 3022.9694 | 163.3997 | -75.7139 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2586.8283 | 166.9597 | -80.7933 | 168.8595 | 450.3377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2632.8834 | 35.7297 | -81.3593 | 168.8595 | 450.3377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2828.4675 | -48.0064 | 7.82 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2976.9142 | 110.1815 | 8.94 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3022.9694 | -29.021 | 8.09 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2874.5227 | 35.7297 | 7.79 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.717 | 202] 1.5 [DL + RSX] | 3253.7378 | -163.9522 | 109.7743 |
| Bottom | 1.697 | 202] 1.5 [DL + RSX] | 3299.7929 | 163.0785 | -75.4443 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2783.1969 | 164.0213 | -79.7554 | 168.8595 | 450.3377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2829.2521 | 39.8876 | -80.3188 | 168.8595 | 450.3377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3106.9981 | -49.6887 | 8.55 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3253.7378 | 109.7743 | 9.64 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3299.7929 | -25.7039 | 8.77 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3153.0533 | 39.8876 | 8.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.767 | 202] 1.5 [DL + RSX] | 3535.4954 | -163.1846 | 108.5997 |
| Bottom | 1.749 | 202] 1.5 [DL + RSX] | 3581.5506 | 162.4802 | -74.8409 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2982.4084 | 159.9641 | -78.6021 | 184.9763 | 466.4545 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3028.4636 | 44.944 | -79.1357 | 184.9763 | 466.4545 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3393.1026 | -50.3691 | 9.3 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3535.4954 | 108.5997 | 10.35 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3581.5506 | -22.3283 | 9.45 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3439.1577 | 44.944 | 9.35 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.816 | 202] 1.5 [DL + RSX] | 3822.5559 | -162.0408 | 106.1851 |
| Bottom | 1.8 | 202] 1.5 [DL + RSX] | 3868.611 | 161.5628 | -74.6188 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3184.9297 | 154.9785 | -77.2302 | 184.9763 | 466.4545 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3230.9849 | 50.9666 | -77.7105 | 184.9763 | 466.4545 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3822.5559 | -1.4325 | 9.82 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3822.5559 | 106.1851 | 11.06 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3868.611 | -18.2716 | 10.14 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3732.9717 | 50.9666 | 10.17 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.867 | 202] 1.5 [DL + RSX] | 4115.3339 | -160.4426 | 102.0727 |
| Bottom | 1.866 | 202] 1.5 [DL + RSX] | 4161.3891 | 160.1765 | -76.0029 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3391.1259 | 149.3911 | -75.4814 | 168.8595 | 450.3377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3437.1811 | 57.9342 | -75.8967 | 168.8595 | 450.3377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4115.3339 | -2.4238 | 10.58 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4115.3339 | 102.0727 | 11.76 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4161.3891 | -11.8586 | 10.81 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4034.8223 | 57.9342 | 11.03 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.931 | 202] 1.5 [DL + RSX] | 4414.2372 | -158.5314 | 96.1684 |
| Bottom | 1.937 | 202] 1.5 [DL + RSX] | 4460.2923 | 159.0362 | -77.4848 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3601.3715 | 143.8191 | -72.5173 | 168.8595 | 450.3377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3647.4267 | 68.5773 | -72.8686 | 168.8595 | 450.3377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4414.2372 | -1.473 | 11.34 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4414.2372 | 96.1684 | 12.46 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4460.2923 | -77.4848 | 12.35 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4460.2923 | 1.2491 | 11.45 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.987 | 202] 1.5 [DL + RSX] | 4719.6436 | -154.4857 | 91.1107 |
| Bottom | 2.018 | 202] 1.5 [DL + RSX] | 4765.6987 | 154.108 | -133.5805 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3815.891 | 141.7945 | -84.7838 | 168.8595 | 450.3377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3861.9461 | 22.3676 | -85.0756 | 168.8595 | 450.3377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4618.0389 | -45.5634 | 12.38 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4719.6436 | 91.1107 | 13.18 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4765.6987 | -33.9504 | 12.62 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4664.094 | 22.3676 | 12.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P27 | 22295 | 21174 | 1300 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 21824 | 1300 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.043 | 202] 1.5 [DL + RSX] | 5032.5069 | -154.8045 | -43.7303 |
| Bottom | 2.21 | 202] 1.5 [DL + RSX] | 5078.562 | 162.7779 | 292.0622 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4035.8887 | 90.8645 | 134.8673 | 168.8595 | 450.3377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4081.9439 | 393.1243 | 135.0068 | 168.8595 | 450.3377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5032.5069 | -43.7303 | 13.42 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5032.5069 | 30.6943 | 13.27 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3178.1876 | -49.4458 | 8.73 | 5 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 5078.562 | 292.0622 | 16.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.101 | 202] 1.5 [DL + RSX] | 5314.1478 | -226.0726 | -761.3396 |
| Bottom | 1.829 | 202] 1.5 [DL + RSX] | 5374.3738 | 221.9041 | 121.2259 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4257.2849 | -506.0247 | 300.0529 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4317.5108 | 244.6547 | 300.1091 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5314.1478 | -761.3396 | 15.69 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5374.3738 | -23.0792 | 10.7 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5374.3738 | 121.2259 | 11.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.8 | 202] 1.5 [DL + RSX] | 5598.7866 | -203.0185 | 123.0638 |
| Bottom | 1.814 | 202] 1.5 [DL + RSX] | 5659.0126 | 208.2979 | 64.0663 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4496.9981 | 188.7172 | -78.7369 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4557.2241 | 204.8137 | -79.1541 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5595.7638 | -30.3978 | 11.18 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5598.7866 | 123.0638 | 11.83 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5659.0126 | -59.2034 | 11.51 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5659.0126 | 64.0663 | 11.54 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.835 | 202] 1.5 [DL + RSX] | 5891.6583 | -201.884 | 71.3938 |
| Bottom | 1.855 | 202] 1.5 [DL + RSX] | 5951.8843 | 204.9569 | -63.6029 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4743.1366 | 139.0158 | -64.5529 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4803.3626 | 202.2746 | -65.131 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5934.87 | -83.5073 | 12.21 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5934.87 | 139.0158 | 12.6 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5995.096 | -215.6116 | 13.25 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5995.096 | 202.2746 | 13.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.859 | 202] 1.5 [DL + RSX] | 6193.2558 | -194.6492 | 55.6558 |
| Bottom | 1.886 | 202] 1.5 [DL + RSX] | 6253.4818 | 199.0025 | -57.4717 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4996.9126 | 117.9068 | -56.9933 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5057.1386 | 218.3249 | -57.6905 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6282.2234 | -95.0573 | 12.98 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6282.2234 | 117.9068 | 13.13 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6342.4493 | -219.3937 | 13.95 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6342.4493 | 218.3249 | 13.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.885 | 202] 1.5 [DL + RSX] | 6503.929 | -186.5735 | 51.6148 |
| Bottom | 1.92 | 202] 1.5 [DL + RSX] | 6564.155 | 191.8911 | 65.3181 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5259.1497 | 109.5962 | -53.5729 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5319.3757 | 236.1981 | -54.3347 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6637.7702 | -90.77 | 13.64 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6637.7702 | 109.5962 | 13.77 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6697.9961 | -228.1548 | 14.71 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6697.9961 | 236.1981 | 14.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.916 | 202] 1.5 [DL + RSX] | 6824.0907 | -176.9882 | 44.3436 |
| Bottom | 1.953 | 202] 1.5 [DL + RSX] | 6884.3166 | 183.3895 | 79.7893 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5530.9283 | 104.5521 | 50.6868 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5591.1543 | 258.7475 | 51.4553 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7001.3036 | -93.6156 | 14.38 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7001.3036 | 104.5521 | 14.45 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7061.5296 | -240.7853 | 15.51 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7061.5296 | 258.7475 | 15.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.952 | 202] 1.5 [DL + RSX] | 7154.3078 | -165.7507 | 38.7871 |
| Bottom | 1.999 | 202] 1.5 [DL + RSX] | 7214.5337 | 173.7963 | 102.6584 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5813.7438 | 111.3155 | 52.2193 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5873.9698 | 288.9997 | 52.9272 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7372.553 | -108.489 | 15.21 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7372.553 | 111.3155 | 15.23 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7432.779 | -257.0991 | 16.35 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7432.779 | 288.9997 | 16.57 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.985 | 202] 1.5 [DL + RSX] | 7495.1102 | -151.3576 | -45.3982 |
| Bottom | 2.038 | 202] 1.5 [DL + RSX] | 7555.3362 | 159.9252 | 128.4314 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6109.4588 | 136.1032 | 50.8628 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6169.6848 | 319.2377 | 51.4545 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7751.0168 | -138.461 | 16.16 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7751.0168 | 136.1032 | 16.14 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7811.2428 | -287.633 | 17.31 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7811.2428 | 319.2377 | 17.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.029 | 202] 1.5 [DL + RSX] | 7846.6474 | -137.6266 | -79.2639 |
| Bottom | 2.113 | 202] 1.5 [DL + RSX] | 7908.7853 | 157.9769 | 158.9396 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6419.763 | 169.1087 | 46.7887 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6481.9009 | 346.6597 | 47.247 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8135.8437 | -192.4005 | 17.28 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8135.8437 | 169.1087 | 17.12 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8197.9816 | -313.2274 | 18.24 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8197.9816 | 346.6597 | 18.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.612 | 202] 1.5 [DL + RSX] | 8230.2214 | 316.1417 | -116.5135 |
| Bottom | 2.675 | 202] 1.5 [DL + RSX] | 8310.5227 | 318.5026 | 268.2959 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6767.0783 | 209.7828 | 51.3408 | 216.648 | 584.735 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 6847.3796 | 453.4038 | 51.6249 | 216.648 | 584.735 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8547.4093 | -244.0718 | 18.45 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 8547.4093 | 209.7828 | 18.21 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8627.7106 | -396.1664 | 19.66 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 8627.7106 | 453.4038 | 20.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P27 | 22295 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 22295 | 20524 | 22295 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.595 | 203] 1.5 [DL + RSY] | 9041.5873 | -250.2909 | -363.1797 |
| Bottom | 2.68 | 203] 1.5 [DL + RSY] | 9118.4471 | 252.3611 | 603.2849 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7235.7237 | 298.0884 | 73.5324 | 224.1017 | 592.1887 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7312.5835 | 603.2849 | 73.5805 | 224.1017 | 592.1887 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9041.5873 | -363.1797 | 20.24 | 5 |
| Top–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9041.5873 | 298.0884 | 19.79 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9118.4471 | -536.9138 | 21.59 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 9118.4471 | 603.2849 | 22.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.681 | 202] 1.5 [DL + RSX] | 1087.2988 | 125.1332 | -179.7433 |
| Bottom | 1.196 | 202] 1.5 [DL + RSX] | 1129.8112 | -114.0477 | -36.7699 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 938.1779 | -141.8624 | 55.8884 | 121.7714 | 381.5975 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 980.6904 | 31.4666 | 56.1299 | 123.0859 | 382.912 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1441.0972 | -141.8624 | 5.97 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1483.6097 | -50.2587 | 4.82 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1483.6097 | 31.4666 | 4.56 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.127 | 202] 1.5 [DL + RSX] | 1545.5119 | 108.5837 | 55.7136 |
| Bottom | 1.116 | 202] 1.5 [DL + RSX] | 1588.0244 | -109.305 | -35.653 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1160.1547 | 82.9624 | -34.0686 | 128.6351 | 388.4612 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1202.6671 | 42.5811 | -34.5315 | 129.9496 | 389.7757 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1687.8309 | -56.8233 | 5.48 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1687.8309 | 82.9624 | 5.84 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1730.3433 | -56.171 | 5.59 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1730.3433 | 42.5811 | 5.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.185 | 202] 1.5 [DL + RSX] | 1806.8905 | 110.9962 | 69.0149 |
| Bottom | 1.144 | 202] 1.5 [DL + RSX] | 1849.4029 | -109.5765 | -36.5814 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1379.8305 | 92.1498 | -37.3236 | 135.4277 | 395.2537 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1422.3429 | 44.7261 | -37.8515 | 136.7422 | 396.5683 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1935.5736 | -58.4503 | 6.19 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1935.5736 | 92.1498 | 6.66 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1978.086 | -64.9469 | 6.4 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1978.086 | 44.7261 | 6.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.219 | 202] 1.5 [DL + RSX] | 2073.1473 | 110.2436 | 70.858 |
| Bottom | 1.193 | 202] 1.5 [DL + RSX] | 2115.6598 | -109.1197 | -35.3472 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1597.2377 | 91.9715 | -36.9794 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1639.7501 | 48.8484 | -37.5627 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2183.7799 | -63.8254 | 6.95 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2183.7799 | 91.9715 | 7.34 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2226.2924 | -67.6863 | 7.12 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2226.2924 | 48.8484 | 6.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.277 | 202] 1.5 [DL + RSX] | 2342.5599 | 110.0476 | 75.1665 |
| Bottom | 1.248 | 202] 1.5 [DL + RSX] | 2385.0724 | -108.9024 | -37.1946 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1812.561 | 93.7996 | -38.0102 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1855.0734 | 50.7154 | -38.624 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2432.422 | -63.3666 | 7.64 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2432.422 | 93.7996 | 8.06 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2474.9345 | -70.5069 | 7.85 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2474.9345 | 50.7154 | 7.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.331 | 202] 1.5 [DL + RSX] | 2614.1062 | 109.5998 | 77.7074 |
| Bottom | 1.303 | 202] 1.5 [DL + RSX] | 2656.6187 | -108.5836 | -39.4876 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2025.8271 | 93.4288 | -38.663 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2068.3396 | 52.5035 | -39.2713 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2681.5037 | -63.0556 | 8.32 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2681.5037 | 93.4288 | 8.75 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2724.0161 | -73.27 | 8.58 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2724.0161 | 52.5035 | 8.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.297 | 202] 1.5 [DL + RSX] | 2887.1116 | 109.0641 | 79.3241 |
| Bottom | 1.285 | 202] 1.5 [DL + RSX] | 2929.624 | -108.1886 | -41.3095 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2236.9029 | 92.1405 | -39.1768 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2279.4154 | 55.0409 | -39.7428 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2931.0667 | -62.0221 | 9 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2931.0667 | 92.1405 | 9.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2973.5791 | -76.4137 | 9.32 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2973.5791 | 55.0409 | 9.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.363 | 202] 1.5 [DL + RSX] | 3161.1037 | 108.3681 | 79.585 |
| Bottom | 1.353 | 202] 1.5 [DL + RSX] | 3203.6161 | -107.7055 | -43.3625 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2445.6273 | 90.3536 | -39.4063 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2488.1397 | 58.5063 | -39.903 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3181.177 | -60.2772 | 9.67 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3181.177 | 90.3536 | 10.09 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3223.6894 | -79.7353 | 10.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3223.6894 | 58.5063 | 9.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.484 | 202] 1.5 [DL + RSX] | 3435.695 | 107.4021 | 78.2445 |
| Bottom | 1.476 | 202] 1.5 [DL + RSX] | 3478.2074 | -106.9841 | -46.4441 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2651.843 | 88.7859 | -38.9962 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2694.3555 | 63.4494 | -39.411 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3435.695 | -47.5323 | 10.2 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3435.695 | 78.2445 | 10.63 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3478.2074 | -46.4441 | 10.31 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3478.2074 | 28.1484 | 10.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.55 | 202] 1.5 [DL + RSX] | 3710.5413 | 106.2251 | 76.2394 |
| Bottom | 1.554 | 202] 1.5 [DL + RSX] | 3753.0537 | -106.2347 | -63.592 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2855.4185 | 89.3183 | -42.0823 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2897.9309 | 58.3925 | -42.4139 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3710.5413 | -41.901 | 10.89 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3710.5413 | 76.2394 | 11.37 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3753.0537 | -63.592 | 11.31 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3753.0537 | 28.2754 | 10.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.545 | 202] 1.5 [DL + RSX] | 3985.0644 | 104.5483 | 61.0407 |
| Bottom | 1.576 | 202] 1.5 [DL + RSX] | 4027.5769 | -102.8587 | -113.8698 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3056.1607 | 80.4985 | -52.4817 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3098.6732 | 40.8763 | -52.7288 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3985.0644 | -43.9267 | 11.68 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3985.0644 | 61.0407 | 11.92 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4027.5769 | -113.8698 | 12.77 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4027.5769 | 16.6189 | 11.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P28 | 27340 | 21124 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 21724 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.631 | 202] 1.5 [DL + RSX] | 4257.0008 | 107.132 | -68.1298 |
| Bottom | 1.801 | 202] 1.5 [DL + RSX] | 4299.5133 | -118.8476 | 291.1615 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3252.569 | 39.2394 | 104.9835 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3295.0815 | 308.4609 | 105.0544 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4257.0008 | -68.1298 | 12.77 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4257.0008 | 14.6918 | 12.03 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4299.5133 | 291.1615 | 15.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.915 | 202] 1.5 [DL + RSX] | 4567.8317 | 203.6618 | -791.3214 |
| Bottom | 1.602 | 202] 1.5 [DL + RSX] | 4628.0577 | -193.1083 | -145.2015 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3351.3394 | -546.3033 | 228.9422 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3411.5653 | 76.8823 | 229.087 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4567.8317 | -546.3033 | 12.74 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4628.0577 | -145.2015 | 10.08 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4628.0577 | 76.8823 | 9.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.588 | 202] 1.5 [DL + RSX] | 4905.6584 | 184.2333 | -63.381 |
| Bottom | 1.629 | 202] 1.5 [DL + RSX] | 4965.8844 | -187.3266 | 128.6784 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3685.0545 | 88.3365 | 53.4529 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3745.2805 | 214.6368 | 53.8221 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4905.6584 | -63.381 | 10.06 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4905.6584 | 39.9248 | 9.9 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4965.8844 | -52.7086 | 10.1 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4965.8844 | 128.6784 | 10.63 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.648 | 202] 1.5 [DL + RSX] | 5241.8559 | 179.2718 | 121.4257 |
| Bottom | 1.661 | 202] 1.5 [DL + RSX] | 5302.0818 | -182.3307 | -90.1521 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3900.9472 | 171.1554 | -63.5189 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3961.1732 | 184.0621 | -64.0934 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5019.4607 | -44.1419 | 10.15 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5241.8559 | 121.4257 | 11.12 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5302.0818 | -90.1521 | 11.02 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5302.0818 | 86.3746 | 10.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.676 | 202] 1.5 [DL + RSX] | 5575.7392 | 172.8535 | 84.9664 |
| Bottom | 1.705 | 202] 1.5 [DL + RSX] | 5635.9651 | -176.5497 | -102.4082 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4114.8639 | 134.5416 | -55.5732 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4175.0899 | 187.0979 | -56.3027 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5575.7392 | -30.8422 | 11.15 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5575.7392 | 84.9664 | 11.52 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5635.9651 | -102.4082 | 11.76 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5635.9651 | 80.1746 | 11.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.708 | 202] 1.5 [DL + RSX] | 5906.2063 | 166.1389 | 72.2587 |
| Bottom | 1.747 | 202] 1.5 [DL + RSX] | 5966.4323 | -170.6614 | -110.0365 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4326.6879 | 125.3578 | -52.2733 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4386.9139 | 203.5806 | -53.0889 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5906.2063 | -33.1407 | 11.81 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5906.2063 | 72.2587 | 12.08 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5966.4323 | -110.0365 | 12.46 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5966.4323 | 90.5238 | 12.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.745 | 202] 1.5 [DL + RSX] | 6232.5209 | 157.9852 | 66.8598 |
| Bottom | 1.787 | 202] 1.5 [DL + RSX] | 6292.7469 | -163.7085 | -125.4625 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4536.997 | 131.6976 | -51.8642 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4597.2229 | 223.144 | -52.6929 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6232.5209 | -21.6122 | 12.37 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6232.5209 | 66.8598 | 12.68 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6292.7469 | -125.4625 | 13.21 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6292.7469 | 107.8021 | 13.08 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.785 | 202] 1.5 [DL + RSX] | 6553.6862 | 148.5791 | 64.2698 |
| Bottom | 1.834 | 202] 1.5 [DL + RSX] | 6613.9122 | -155.9163 | -152.3166 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4746.5365 | 147.7733 | -51.8419 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4806.7625 | 244.347 | -52.6103 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6553.6862 | -13.0845 | 12.94 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6553.6862 | 64.2698 | 13.3 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6613.9122 | -152.3166 | 14.02 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6613.9122 | 131.3304 | 13.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.823 | 202] 1.5 [DL + RSX] | 6868.3849 | 137.0736 | 77.8443 |
| Bottom | 1.876 | 202] 1.5 [DL + RSX] | 6928.6109 | -144.6821 | -185.9702 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4956.2095 | 173.6781 | -49.5227 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5016.4354 | 277.9798 | -50.1662 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6868.3849 | -25.3913 | 13.64 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6868.3849 | 77.8443 | 14.01 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6928.6109 | -185.9702 | 14.87 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6928.6109 | 173.209 | 14.78 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.869 | 202] 1.5 [DL + RSX] | 7175.1139 | 126.6925 | 122.443 |
| Bottom | 1.975 | 202] 1.5 [DL + RSX] | 7237.2518 | -149.708 | 324.3168 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5166.4369 | 217.5695 | 57.9497 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5228.5748 | 422.911 | 58.4025 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7175.1139 | -56.8854 | 14.46 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7175.1139 | 122.443 | 14.92 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7237.2518 | -183.3609 | 15.46 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7237.2518 | 324.3168 | 16.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.517 | 202] 1.5 [DL + RSX] | 7659.3114 | 284.8211 | -270.9297 |
| Bottom | 2.626 | 202] 1.5 [DL + RSX] | 7739.6127 | -287.182 | 514.491 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5048.8196 | 1.7831 | 117.801 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5129.1209 | 514.491 | 117.8499 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7659.3114 | -270.9297 | 16.89 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7659.3114 | 1.7831 | 15.03 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7739.6127 | -261.0936 | 16.98 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7739.6127 | 514.491 | 18.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P28 | 27340 | 21374 | 1700 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |
| Bottom | Leg 1 | 27340 | 20524 | 27340 | 22224 | 1700 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.569 | 202] 1.5 [DL + RSX] | 8139.8723 | 263.7884 | -411.3629 |
| Bottom | 2.645 | 202] 1.5 [DL + RSX] | 8216.7321 | 265.8585 | 612.8128 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5453.0414 | 214.9496 | 96.6364 | 203.9508 | 572.0377 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5529.9012 | 612.8128 | 96.6445 | 203.9508 | 572.0377 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8139.8723 | -411.3629 | 18.81 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 8139.8723 | 214.9496 | 17.45 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8216.7321 | -508.6589 | 19.63 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 8216.7321 | 612.8128 | 20.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.923 | 202] 1.5 [DL + RSX] | 1168.2565 | -132.3595 | -276.6578 |
| Bottom | 1.259 | 202] 1.5 [DL + RSX] | 1210.769 | 115.4097 | 84.1385 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1070.3174 | -104.1835 | 143.3779 | 127.6415 | 387.4676 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1112.8299 | 126.5804 | 143.7625 | 128.8034 | 388.6295 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1422.4239 | -339.7122 | 8.67 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1464.9364 | -37.5895 | 4.59 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1464.9364 | 126.5804 | 5.83 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.103 | 202] 1.5 [DL + RSX] | 1573.8863 | -104.4134 | -65.0237 |
| Bottom | 1.122 | 202] 1.5 [DL + RSX] | 1616.3987 | 106.5624 | 61.1306 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1321.2453 | 87.2704 | 54.9973 | 134.4994 | 394.3255 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1363.7577 | 105.3995 | 55.4275 | 135.6613 | 395.4874 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1656.7301 | -94.5782 | 5.92 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1656.7301 | 87.2704 | 5.81 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1699.2425 | -55.0615 | 5.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1699.2425 | 105.3995 | 6.18 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.214 | 202] 1.5 [DL + RSX] | 1829.6933 | -111.0913 | -95.0931 |
| Bottom | 1.169 | 202] 1.5 [DL + RSX] | 1872.2057 | 109.2369 | 63.3314 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1568.4184 | 80.736 | 65.5275 | 141.2548 | 401.0809 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1610.9309 | 113.5669 | 65.9626 | 142.4167 | 402.2427 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1890.4392 | -124.5828 | 6.98 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1890.4392 | 80.736 | 6.37 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1932.9517 | -58.7098 | 6.18 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1932.9517 | 113.5669 | 6.95 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.247 | 202] 1.5 [DL + RSX] | 2090.6567 | -110.8394 | -99.0129 |
| Bottom | 1.225 | 202] 1.5 [DL + RSX] | 2133.1692 | 109.8229 | 65.6238 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1813.8511 | 85.1603 | 65.6006 | 147.584 | 407.4101 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1856.3635 | 117.4332 | 66.0721 | 147.584 | 407.4101 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2125.1842 | -124.8194 | 7.64 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2125.1842 | 85.1603 | 7.09 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2167.6966 | -63.2424 | 6.9 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2167.6966 | 117.4332 | 7.65 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.276 | 202] 1.5 [DL + RSX] | 2354.6159 | -111.9951 | -103.8794 |
| Bottom | 1.253 | 202] 1.5 [DL + RSX] | 2397.1283 | 110.9786 | 69.2593 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2057.6822 | 86.4478 | 66.0623 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2100.1946 | 119.7871 | 66.5656 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2361.1361 | -126.3294 | 8.31 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2361.1361 | 86.4478 | 7.76 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2403.6486 | -67.0557 | 7.61 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2403.6486 | 119.7871 | 8.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.339 | 202] 1.5 [DL + RSX] | 2620.4117 | -112.8515 | -108.5523 |
| Bottom | 1.317 | 202] 1.5 [DL + RSX] | 2662.9241 | 112.0756 | 73.6084 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2300.0631 | 86.9108 | 66.7692 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2342.5755 | 122.1373 | 67.2845 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2620.4117 | -108.5523 | 8.79 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2620.4117 | 67.7145 | 8.22 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2662.9241 | -21.8898 | 7.7 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2662.9241 | 73.6084 | 8.42 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.382 | 202] 1.5 [DL + RSX] | 2887.4324 | -113.7672 | -112.177 |
| Bottom | 1.365 | 202] 1.5 [DL + RSX] | 2929.9448 | 113.2243 | 78.3114 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2541.14 | 86.9275 | 67.4849 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2583.6524 | 125.028 | 67.9849 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2887.4324 | -112.177 | 9.58 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2887.4324 | 70.8353 | 9 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2929.9448 | -27.1023 | 8.52 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2929.9448 | 78.3114 | 9.23 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.447 | 202] 1.5 [DL + RSX] | 3155.3803 | -114.6378 | -114.0054 |
| Bottom | 1.444 | 202] 1.5 [DL + RSX] | 3197.8928 | 114.3726 | 84.0897 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2781.0769 | 86.4541 | 68.0254 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2823.5894 | 128.4971 | 68.484 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3155.3803 | -114.0054 | 10.35 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3155.3803 | 72.8169 | 9.78 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3197.8928 | -32.7156 | 9.34 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3197.8928 | 84.0897 | 10.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.48 | 202] 1.5 [DL + RSX] | 3424.1198 | -115.4665 | -113.2448 |
| Bottom | 1.482 | 202] 1.5 [DL + RSX] | 3466.6322 | 115.6193 | 91.8881 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3020.0465 | 85.9502 | 68.175 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3062.5589 | 132.0528 | 68.5739 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3424.1198 | -113.2448 | 11.08 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3424.1198 | 73.2606 | 10.53 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3466.6322 | -39.9037 | 10.18 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3466.6322 | 91.8881 | 10.91 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.55 | 202] 1.5 [DL + RSX] | 3693.5437 | -116.0054 | -109.3169 |
| Bottom | 1.559 | 202] 1.5 [DL + RSX] | 3736.0562 | 116.2561 | 102.9711 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3258.1749 | 86.0791 | 68.2256 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3300.6873 | 136.2237 | 68.5565 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3693.5437 | -109.3169 | 11.78 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3693.5437 | 71.6496 | 11.25 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3736.0562 | -50.649 | 11.08 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3736.0562 | 102.9711 | 11.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.622 | 202] 1.5 [DL + RSX] | 3963.8048 | -117.318 | -101.039 |
| Bottom | 1.646 | 202] 1.5 [DL + RSX] | 4006.3172 | 119.3706 | -109.5373 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3495.8155 | 85.9479 | -53.3073 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3538.328 | 90.3531 | -53.5716 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3963.8048 | -101.039 | 12.41 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3963.8048 | 65.7505 | 11.92 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4006.3172 | -109.5373 | 12.65 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4006.3172 | 72.0638 | 12.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P29 | 0 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.699 | 202] 1.5 [DL + RSX] | 4236.5802 | -114.8313 | -139.6462 |
| Bottom | 1.817 | 202] 1.5 [DL + RSX] | 4279.0927 | 115.8639 | 376.6405 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3734.712 | 41.2862 | 171.0323 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3777.2244 | 416.6638 | 171.2023 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4236.5802 | -139.6462 | 13.71 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4236.5802 | 5.4032 | 11.84 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2525.7677 | -3.9129 | 7.07 | 5 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4279.0927 | 376.6405 | 17.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.5 | 202] 1.5 [DL + RSX] | 4474.6645 | -113.1279 | -1095.9807 |
| Bottom | 1.254 | 202] 1.5 [DL + RSX] | 4538.4332 | 114.1481 | 251.0245 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3948.9692 | -818.6159 | 452.2848 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4012.7379 | 348.2041 | 452.48 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4474.6645 | -864.3958 | 13.62 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4538.4332 | -98.1398 | 9.01 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4538.4332 | 251.0245 | 9.95 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.248 | 202] 1.5 [DL + RSX] | 4749.5261 | -110.8855 | -116.4315 |
| Bottom | 1.299 | 202] 1.5 [DL + RSX] | 4813.2948 | 114.0355 | 240.8224 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4215.3406 | 132.1591 | 129.9256 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4279.1093 | 356.142 | 130.3474 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4749.5261 | -116.4315 | 9.51 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4749.5261 | 81.3187 | 9.3 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4813.2948 | -81.5561 | 9.42 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4813.2948 | 240.8224 | 10.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.292 | 202] 1.5 [DL + RSX] | 5024.333 | -106.788 | -116.1856 |
| Bottom | 1.33 | 202] 1.5 [DL + RSX] | 5088.1017 | 111.6821 | 203.9677 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4477.6892 | 145.4321 | 117.1411 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4541.4579 | 333.6256 | 117.7024 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5024.333 | -116.1856 | 10.02 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5024.333 | 101.9284 | 9.93 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5088.1017 | -108.2051 | 10.09 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5088.1017 | 203.9677 | 10.68 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.343 | 202] 1.5 [DL + RSX] | 5297.7505 | -103.4088 | -143.1863 |
| Bottom | 1.379 | 202] 1.5 [DL + RSX] | 5361.5191 | 109.1833 | 202.7321 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4734.6098 | 110.7024 | 123.8114 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4798.3785 | 343.8582 | 124.4884 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5297.7505 | -143.1863 | 10.69 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5297.7505 | 76.7652 | 10.28 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5361.5191 | -116.2553 | 10.65 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5361.5191 | 202.7321 | 11.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.388 | 202] 1.5 [DL + RSX] | 5569.599 | -99.6439 | -136.3839 |
| Bottom | 1.429 | 202] 1.5 [DL + RSX] | 5633.3677 | 106.5898 | 214.2763 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4982.5492 | 94.5786 | 121.7366 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5046.3179 | 361.2912 | 122.4924 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5569.599 | -136.3839 | 11.16 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5569.599 | 68.0941 | 10.73 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5633.3677 | -127.141 | 11.22 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5633.3677 | 214.2763 | 11.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.427 | 202] 1.5 [DL + RSX] | 5839.1756 | -95.1411 | -116.488 |
| Bottom | 1.48 | 202] 1.5 [DL + RSX] | 5902.9442 | 103.7785 | 234.2122 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5213.4134 | 84.7028 | 116.7767 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5277.1821 | 381.0908 | 117.5536 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5839.1756 | -116.488 | 11.53 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5839.1756 | 56.4063 | 11.16 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5902.9442 | -146.1772 | 11.83 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5902.9442 | 234.2122 | 12.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.461 | 202] 1.5 [DL + RSX] | 6105.7133 | -89.6206 | -87.8055 |
| Bottom | 1.529 | 202] 1.5 [DL + RSX] | 6169.482 | 99.8404 | 264.2014 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5427.4475 | 86.5024 | 110.8051 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5491.2162 | 404.9074 | 111.5364 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6105.7133 | -87.8055 | 11.85 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6105.7133 | 37.2724 | 11.54 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6169.482 | -175.5214 | 12.51 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6169.482 | 264.2014 | 13.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.495 | 202] 1.5 [DL + RSX] | 6368.5119 | -84.097 | 19.1928 |
| Bottom | 1.584 | 202] 1.5 [DL + RSX] | 6432.2806 | 97.9432 | 306.7533 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5634.584 | 110.9424 | 104.1717 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5698.3526 | 435.9851 | 104.7917 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6368.5119 | -59.314 | 12.16 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6368.5119 | 19.1928 | 11.91 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5847.6283 | -350.7242 | 12.99 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6432.2806 | 306.7533 | 13.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.541 | 202] 1.5 [DL + RSX] | 6626.7184 | -73.69 | 49.4522 |
| Bottom | 1.623 | 202] 1.5 [DL + RSX] | 6692.5115 | 89.4214 | 346.8881 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5839.7081 | 159.2692 | 86.8727 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5905.5012 | 451.8436 | 87.3413 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6626.7184 | -82.9875 | 12.78 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6626.7184 | 49.4522 | 12.58 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6692.5115 | -301.5352 | 14.25 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6692.5115 | 346.8881 | 14.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.066 | 202] 1.5 [DL + RSX] | 6880.175 | -255.2032 | -179.8717 |
| Bottom | 2.186 | 202] 1.5 [DL + RSX] | 6965.1998 | 257.7029 | 521.443 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5434.873 | 117.1331 | 91.1407 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5519.8979 | 521.443 | 91.1927 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6880.175 | -179.8717 | 13.85 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6880.175 | 117.1331 | 13.46 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6965.1998 | -478.8249 | 15.85 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6965.1998 | 521.443 | 16.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P29 | 0 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 24995 | 0 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.067 | 202] 1.5 [DL + RSX] | 7190.3061 | -225.3772 | -369.3729 |
| Bottom | 2.168 | 202] 1.5 [DL + RSX] | 7271.6871 | 227.5691 | 708.6531 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5689.0592 | 309.3667 | 97.1119 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5770.4402 | 708.6531 | 97.1205 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7190.3061 | -369.3729 | 15.6 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7190.3061 | 309.3667 | 15.23 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7271.6871 | -629.302 | 17.35 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7271.6871 | 708.6531 | 17.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.956 | 202] 1.5 [DL + RSX] | 1151.3728 | 133.8185 | -271.3863 |
| Bottom | 1.282 | 202] 1.5 [DL + RSX] | 1193.8853 | -117.188 | 77.5381 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1053.0931 | -97.6888 | 139.9009 | 127.1707 | 386.9968 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1095.6055 | 119.826 | 140.2878 | 128.3326 | 388.1587 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1402.9925 | -335.424 | 8.56 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1445.505 | -43.7618 | 4.62 | 6 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1445.505 | 119.826 | 5.68 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.118 | 202] 1.5 [DL + RSX] | 1555.3163 | 105.9432 | -67.6532 |
| Bottom | 1.13 | 202] 1.5 [DL + RSX] | 1597.8288 | -108.1327 | 57.3257 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1303.8678 | 85.1635 | 54.7699 | 134.0245 | 393.8506 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1346.3802 | 101.1286 | 55.2058 | 135.1864 | 395.0125 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1637.4665 | -98.4643 | 5.92 | 6 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1637.4665 | 85.1635 | 5.73 | 6 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1679.979 | -58.4043 | 5.48 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1679.979 | 101.1286 | 6.07 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.225 | 202] 1.5 [DL + RSX] | 1812.8853 | 112.3871 | -96.0591 |
| Bottom | 1.177 | 202] 1.5 [DL + RSX] | 1855.3978 | -110.5528 | 60.9834 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1550.7528 | 81.148 | 65.3908 | 140.772 | 400.598 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1593.2652 | 110.524 | 65.8412 | 141.9338 | 401.7599 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1871.1549 | -127.6615 | 6.97 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1871.1549 | 81.148 | 6.32 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1913.6673 | -60.5402 | 6.16 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1913.6673 | 110.524 | 6.85 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.253 | 202] 1.5 [DL + RSX] | 2075.5979 | 112.1023 | -99.16 |
| Bottom | 1.228 | 202] 1.5 [DL + RSX] | 2118.1103 | -111.0089 | 63.9979 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1795.7502 | 86.8932 | 65.6572 | 147.4678 | 407.2939 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1838.2626 | 115.1133 | 66.1508 | 147.584 | 407.4101 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2105.6929 | -127.5351 | 7.62 | 6 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2105.6929 | 86.8932 | 7.06 | 6 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2148.2053 | -64.3415 | 6.86 | 6 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2148.2053 | 115.1133 | 7.57 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.28 | 202] 1.5 [DL + RSX] | 2341.1364 | 113.2017 | -103.5478 |
| Bottom | 1.256 | 202] 1.5 [DL + RSX] | 2383.6489 | -112.0717 | 67.9259 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2039.0368 | 88.6805 | 66.2926 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2081.5492 | 118.0341 | 66.8171 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2341.2987 | -128.6088 | 8.29 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2341.2987 | 88.6805 | 7.74 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2383.8111 | -68.0181 | 7.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2383.8111 | 118.0341 | 8.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.344 | 202] 1.5 [DL + RSX] | 2608.3459 | 114.0212 | -107.975 |
| Bottom | 1.32 | 202] 1.5 [DL + RSX] | 2650.8584 | -113.1066 | 72.3257 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2280.7794 | 89.0839 | 67.1333 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2323.2918 | 120.9862 | 67.6605 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2608.3459 | -107.975 | 8.75 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2608.3459 | 67.5386 | 8.18 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2650.8584 | -23.0686 | 7.68 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2650.8584 | 72.3257 | 8.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.387 | 202] 1.5 [DL + RSX] | 2876.6478 | 114.9032 | -111.5241 |
| Bottom | 1.366 | 202] 1.5 [DL + RSX] | 2919.1602 | -114.2091 | 76.9424 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2521.1303 | 88.7146 | 67.9231 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2563.6427 | 124.5488 | 68.4205 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2876.6478 | -111.5241 | 9.54 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2876.6478 | 70.6891 | 8.97 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2919.1602 | -28.2097 | 8.5 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2919.1602 | 76.9424 | 9.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.45 | 202] 1.5 [DL + RSX] | 3145.7749 | 115.7426 | -113.4084 |
| Bottom | 1.445 | 202] 1.5 [DL + RSX] | 3188.2873 | -115.3255 | 82.5319 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2760.2541 | 87.7411 | 68.4648 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2802.7666 | 128.6457 | 68.9062 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3145.7749 | -113.4084 | 10.31 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3145.7749 | 72.5681 | 9.75 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3188.2873 | -33.8613 | 9.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3188.2873 | 82.5319 | 10 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.483 | 202] 1.5 [DL + RSX] | 3415.6122 | 116.528 | -112.8381 |
| Bottom | 1.483 | 202] 1.5 [DL + RSX] | 3458.1247 | -116.5281 | 90.017 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2998.3185 | 86.7587 | 68.5497 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3040.831 | 132.6039 | 68.9226 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3415.6122 | -112.8381 | 11.06 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3415.6122 | 72.7583 | 10.5 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3458.1247 | -41.2472 | 10.18 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3458.1247 | 90.017 | 10.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.553 | 202] 1.5 [DL + RSX] | 3686.0639 | 117.0275 | -109.3029 |
| Bottom | 1.561 | 202] 1.5 [DL + RSX] | 3728.5763 | -117.1891 | 100.7582 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3235.4416 | 86.4125 | 68.5565 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3277.954 | 136.9645 | 68.8615 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3686.0639 | -109.3029 | 11.76 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3686.0639 | 70.641 | 11.22 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3728.5763 | -52.2521 | 11.08 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3728.5763 | 100.7582 | 11.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.624 | 202] 1.5 [DL + RSX] | 3957.2852 | 118.1778 | -101.567 |
| Bottom | 1.649 | 202] 1.5 [DL + RSX] | 3999.7976 | -120.0032 | -112.3976 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3471.9606 | 85.8398 | -54.5139 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3514.473 | 90.3382 | -54.7625 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3957.2852 | -101.567 | 12.4 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3957.2852 | 64.0508 | 11.88 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3999.7976 | -112.3976 | 12.67 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3999.7976 | 68.9568 | 12.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P30 | 27340 | 25595 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26195 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.703 | 202] 1.5 [DL + RSX] | 4230.8742 | 115.9091 | -141.7077 |
| Bottom | 1.822 | 202] 1.5 [DL + RSX] | 4273.3866 | -117.6898 | 371.329 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3709.5352 | 39.6371 | 171.2022 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3752.0476 | 415.5074 | 171.371 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4230.8742 | -141.7077 | 13.72 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4230.8742 | 1.8124 | 11.78 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2511.484 | -9.669 | 7.11 | 5 |
| Botttom–Right | Leg 1 | 450 | 207] [0.9 DL + 1.5 RSY] | 4273.3866 | 371.329 | 17.03 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.508 | 202] 1.5 [DL + RSX] | 4470.9694 | 114.8679 | -1098.8718 |
| Bottom | 1.26 | 202] 1.5 [DL + RSX] | 4534.7381 | -115.5516 | 259.6481 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3924.2698 | -812.6021 | 457.7439 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3988.0384 | 363.7187 | 457.9496 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4470.9694 | -860.4053 | 13.59 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4534.7381 | -91.1321 | 8.96 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4534.7381 | 259.6481 | 10 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.252 | 202] 1.5 [DL + RSX] | 4747.1701 | 112.8917 | -112.274 |
| Bottom | 1.305 | 202] 1.5 [DL + RSX] | 4810.9388 | -115.4615 | 245.9296 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4191.1388 | 141.7877 | 131.5355 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4254.9074 | 365.8779 | 131.9939 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4747.1701 | -112.274 | 9.48 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4747.1701 | 85.5445 | 9.32 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4810.9388 | -77.8274 | 9.39 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4810.9388 | 245.9296 | 10.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.296 | 202] 1.5 [DL + RSX] | 5023.177 | 108.4849 | -114.2557 |
| Bottom | 1.335 | 202] 1.5 [DL + RSX] | 5086.9457 | -112.9236 | 207.1527 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4453.9542 | 152.9762 | 119.1699 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4517.7228 | 339.8063 | 119.7723 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5023.177 | -114.2557 | 10.01 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5023.177 | 103.6299 | 9.94 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5086.9457 | -106.1991 | 10.08 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5086.9457 | 207.1527 | 10.7 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.347 | 202] 1.5 [DL + RSX] | 5297.6002 | 104.8267 | -142.6462 |
| Bottom | 1.381 | 202] 1.5 [DL + RSX] | 5361.3688 | -110.1791 | 205.0104 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4711.2195 | 116.2353 | 126.266 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4774.9882 | 348.4665 | 126.9784 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5297.6002 | -142.6462 | 10.69 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5297.6002 | 77.4479 | 10.29 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5361.3688 | -115.0797 | 10.64 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5361.3688 | 205.0104 | 11.19 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.391 | 202] 1.5 [DL + RSX] | 5570.2538 | 100.8035 | -136.5125 |
| Bottom | 1.431 | 202] 1.5 [DL + RSX] | 5634.0225 | -107.3366 | 215.9696 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4958.6715 | 97.8837 | 124.369 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5022.4401 | 365.3997 | 125.148 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5570.2538 | -136.5125 | 11.16 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5570.2538 | 68.5332 | 10.74 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5634.0225 | -126.5386 | 11.21 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5634.0225 | 215.9696 | 11.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.43 | 202] 1.5 [DL + RSX] | 5840.4216 | 95.9967 | -117.0324 |
| Bottom | 1.481 | 202] 1.5 [DL + RSX] | 5904.1903 | -104.2309 | 235.3772 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5186.284 | 85.3285 | 119.4474 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5250.0527 | 385.3339 | 120.2325 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5840.4216 | -117.0324 | 11.54 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5840.4216 | 56.7454 | 11.17 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5904.1903 | -146.0634 | 11.84 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5904.1903 | 235.3772 | 12.39 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.463 | 202] 1.5 [DL + RSX] | 6107.3162 | 90.1566 | -88.6692 |
| Bottom | 1.53 | 202] 1.5 [DL + RSX] | 6171.0849 | -99.9856 | 265.001 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5396.0976 | 84.6704 | 113.4712 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5459.8663 | 409.8116 | 114.1973 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6107.3162 | -88.6692 | 11.86 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6107.3162 | 37.4379 | 11.54 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6171.0849 | -175.6295 | 12.51 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6171.0849 | 265.001 | 13.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.496 | 202] 1.5 [DL + RSX] | 6370.2073 | 84.2383 | 19.0153 |
| Bottom | 1.584 | 202] 1.5 [DL + RSX] | 6433.976 | -97.581 | 306.0882 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5599.8184 | 108.3987 | 106.3213 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5663.587 | 440.4881 | 106.9282 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6370.2073 | -60.0034 | 12.17 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6370.2073 | 19.0153 | 11.91 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5819.0643 | -357.2918 | 12.98 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6433.976 | 306.0882 | 13.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.542 | 202] 1.5 [DL + RSX] | 6628.2102 | 73.6882 | 47.4129 |
| Bottom | 1.624 | 202] 1.5 [DL + RSX] | 6694.0032 | -89.2543 | 348.372 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5801.9244 | 156.3445 | 90.1357 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5867.7175 | 460.2881 | 90.5891 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6628.2102 | -84.3422 | 12.8 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6628.2102 | 47.4129 | 12.57 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6694.0032 | -301.6592 | 14.26 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6694.0032 | 348.372 | 14.55 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.992 | 202] 1.5 [DL + RSX] | 6879.8866 | 233.1002 | -180.1566 |
| Bottom | 2.095 | 202] 1.5 [DL + RSX] | 6964.9115 | -235.5999 | 508.8567 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5363.9496 | 116.8425 | 88.25 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5448.9745 | 508.8567 | 88.3024 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6879.8866 | -180.1566 | 13.85 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6879.8866 | 116.8425 | 13.46 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6964.9115 | -449.1161 | 15.67 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6964.9115 | 508.8567 | 16.04 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P30 | 27340 | 25895 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 24995 | 27340 | 26795 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.102 | 202] 1.5 [DL + RSX] | 7191.9697 | 234.0725 | -396.8296 |
| Bottom | 2.197 | 202] 1.5 [DL + RSX] | 7273.3507 | 236.2644 | 697.3596 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5636.9945 | 330.9501 | 89.0183 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5718.3755 | 697.3596 | 89.027 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7191.9697 | -396.8296 | 15.77 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7191.9697 | 330.9501 | 15.36 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7273.3507 | -626.6624 | 17.34 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7273.3507 | 697.3596 | 17.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.102 | 202] 1.5 [DL + RSX] | 1570.8794 | -82.5832 | 247.405 |
| Bottom | 0.866 | 202] 1.5 [DL + RSX] | 1613.3919 | 76.2828 | 29.944 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1457.8966 | 251.2184 | -88.043 | 137.8415 | 397.6676 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1500.409 | 46.2998 | -88.0857 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1625.383 | 251.2184 | 8 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1667.8955 | -44.5075 | 5.25 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1667.8955 | 46.2998 | 5.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.975 | 202] 1.5 [DL + RSX] | 1784.566 | -76.9044 | -122.9879 |
| Bottom | 0.94 | 202] 1.5 [DL + RSX] | 1827.0785 | 76.3516 | 68.8249 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1620.7125 | -3.9424 | 56.618 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1663.2249 | 88.3038 | 56.8514 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1846.8815 | -3.9424 | 5.18 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1153.3627 | 22.1342 | 3.51 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1889.394 | -16.9906 | 5.48 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1889.394 | 88.3038 | 6.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.026 | 202] 1.5 [DL + RSX] | 2008.7922 | -80.3058 | -96.855 |
| Bottom | 1.004 | 202] 1.5 [DL + RSX] | 2051.3046 | 78.5016 | 72.1109 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1785.1553 | 32.0389 | 47.3063 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1827.6678 | 95.3874 | 47.5962 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2069.82 | -98.5506 | 7.12 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2069.82 | 32.0389 | 6.19 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2112.3324 | -17.662 | 6.11 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2112.3324 | 95.3874 | 7.19 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.089 | 202] 1.5 [DL + RSX] | 2236.0717 | -82.6501 | -97.321 |
| Bottom | 1.072 | 202] 1.5 [DL + RSX] | 2278.5842 | 80.8271 | 72.68 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1950.6748 | 36.7483 | 46.0108 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1993.1872 | 96.8472 | 46.3591 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2293.7348 | -97.3665 | 7.72 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2293.7348 | 36.7483 | 6.88 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2336.2472 | -20.8681 | 6.78 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2336.2472 | 96.8472 | 7.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.156 | 202] 1.5 [DL + RSX] | 2464.9274 | -84.7481 | -100.4204 |
| Bottom | 1.147 | 202] 1.5 [DL + RSX] | 2507.4399 | 83.0366 | 74.2443 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2117.1294 | 36.1021 | 45.5768 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2159.6418 | 97.0341 | 45.982 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2518.4195 | -98.1546 | 8.36 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2518.4195 | 36.1021 | 7.5 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2560.932 | -22.4862 | 7.43 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2560.932 | 97.0341 | 8.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.231 | 202] 1.5 [DL + RSX] | 2694.7876 | -86.5874 | -103.0345 |
| Bottom | 1.222 | 202] 1.5 [DL + RSX] | 2737.3 | 85.0488 | 76.0701 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2333.1721 | 40.0265 | 46.2144 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2375.6845 | 76.0701 | 46.4115 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2743.6502 | -98.0866 | 8.98 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2743.6502 | 35.0786 | 8.11 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2786.1626 | -23.4735 | 8.07 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2786.1626 | 96.9417 | 9.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.219 | 202] 1.5 [DL + RSX] | 2925.2838 | -88.1985 | -104.6879 |
| Bottom | 1.21 | 202] 1.5 [DL + RSX] | 2967.7963 | 86.8568 | 77.8062 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2495.9326 | 41.2742 | 47.1467 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2538.4451 | 77.8062 | 47.3445 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2969.2092 | -97.0919 | 9.6 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2969.2092 | 33.6782 | 8.72 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3011.7217 | -24.4674 | 8.71 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3011.7217 | 97.2953 | 9.72 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.285 | 202] 1.5 [DL + RSX] | 3156.0987 | -89.5469 | -104.6091 |
| Bottom | 1.278 | 202] 1.5 [DL + RSX] | 3198.6111 | 88.4756 | 80.1773 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2658.7823 | 41.5289 | 48.0755 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2701.2948 | 80.1773 | 48.275 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3194.8485 | -95.0811 | 10.2 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3194.8485 | 32.0009 | 9.32 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3237.361 | -25.5166 | 9.35 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3237.361 | 98.4273 | 10.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.386 | 202] 1.5 [DL + RSX] | 3386.8985 | -90.5242 | -102.1784 |
| Bottom | 1.384 | 202] 1.5 [DL + RSX] | 3429.4109 | 89.7544 | 83.7774 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2821.59 | 40.6032 | 48.6992 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2864.1025 | 83.7774 | 48.8881 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3420.2686 | -92.2004 | 10.78 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3420.2686 | 30.6253 | 9.93 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3462.7811 | -27.4208 | 10 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3462.7811 | 99.4161 | 11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.448 | 202] 1.5 [DL + RSX] | 3617.3226 | -91.209 | -97.949 |
| Bottom | 1.454 | 202] 1.5 [DL + RSX] | 3659.8351 | 91.1242 | 89.054 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2984.2024 | 37.3625 | 48.961 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3026.7149 | 89.054 | 49.1284 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3645.0984 | -89.8817 | 11.37 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3645.0984 | 29.2952 | 10.53 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3687.6109 | -31.2409 | 10.68 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3687.6109 | 98.9164 | 11.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.259 | 202] 1.5 [DL + RSX] | 3847.0502 | -90.8547 | -92.6371 |
| Bottom | 1.281 | 202] 1.5 [DL + RSX] | 3889.5626 | 88.9456 | 139.3074 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3146.7002 | 29.9994 | 62.5925 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3189.2126 | 139.3074 | 62.7387 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3869.1039 | -90.3604 | 12 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3869.1039 | 27.7227 | 11.13 | 5 |
| Bottom–Left | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 2495.8613 | -27.9166 | 7.32 | 5 |
| Botttom–Right | Leg 1 | 300 | 207] [0.9 DL + 1.5 RSY] | 3911.6164 | 144.0593 | 12.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P31 | 0 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 0 | 29330 | 0 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.321 | 202] 1.5 [DL + RSX] | 4076.7948 | -95.6996 | 63.9068 |
| Bottom | 1.49 | 202] 1.5 [DL + RSX] | 4119.3072 | 111.9241 | -313.359 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3309.2465 | 63.9068 | -108.7175 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3351.7589 | -87.9167 | -108.8334 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4092.5222 | -47.7044 | 12.03 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4092.5222 | 69.0801 | 12.33 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4135.0347 | -283.0153 | 15.42 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.831 | 202] 1.5 [DL + RSX] | 4327.4109 | -196.7163 | 951.07 |
| Bottom | 1.477 | 202] 1.5 [DL + RSX] | 4391.1796 | 187.5738 | 177.1824 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3465.6745 | 951.07 | -317.0937 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3529.4432 | 177.1824 | -317.2503 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4336.8492 | 953.4766 | 13.92 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4400.6179 | -170.6907 | 9.2 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4391.1796 | 177.1824 | 9.23 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.477 | 202] 1.5 [DL + RSX] | 4620.1065 | -184.707 | -130.1678 |
| Bottom | 1.508 | 202] 1.5 [DL + RSX] | 4683.8751 | 187.609 | 159.3131 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3617.3079 | 59.8592 | 78.9081 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3681.0766 | 236.7131 | 79.2365 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4654.3758 | -167.2914 | 9.65 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4654.3758 | 59.8592 | 8.99 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4718.1444 | -184.9187 | 9.88 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4718.1444 | 236.7131 | 10.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.509 | 202] 1.5 [DL + RSX] | 4910.3016 | -178.3319 | -143.9274 |
| Bottom | 1.545 | 202] 1.5 [DL + RSX] | 4974.0702 | 183.0835 | 174.7888 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3776.8431 | 64.4159 | 89.781 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3840.6118 | 270.8219 | 90.3268 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4969.166 | -182.1407 | 10.33 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4969.166 | 64.4159 | 9.6 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5032.9347 | -176.8216 | 10.41 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5032.9347 | 270.8219 | 10.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.538 | 202] 1.5 [DL + RSX] | 5196.8535 | -174.0329 | -120.5996 |
| Bottom | 1.581 | 202] 1.5 [DL + RSX] | 5260.6222 | 179.0958 | 175.9664 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3935.4317 | 88.4636 | 82.0196 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3999.2004 | 284.3169 | 82.7411 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5279.577 | -160.0444 | 10.76 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5279.577 | 88.4636 | 10.32 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5343.3456 | -193.5438 | 11.09 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5343.3456 | 284.3169 | 11.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.566 | 202] 1.5 [DL + RSX] | 5479.6935 | -168.5571 | -111.5557 |
| Bottom | 1.619 | 202] 1.5 [DL + RSX] | 5543.4622 | 174.6916 | 185.9073 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4094.3222 | 88.7337 | 80.9457 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4158.0909 | 301.9605 | 81.7811 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5585.2949 | -158.8776 | 11.32 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5585.2949 | 88.7337 | 10.89 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5649.0635 | -211.9185 | 11.77 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5649.0635 | 301.9605 | 12.33 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.586 | 202] 1.5 [DL + RSX] | 5758.3585 | -161.6361 | -95.5036 |
| Bottom | 1.654 | 202] 1.5 [DL + RSX] | 5822.1271 | 169.1929 | 205.9726 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4254.4391 | 95.3133 | 79.3932 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4318.2078 | 324.9709 | 80.2666 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5885.4745 | -161.4641 | 11.9 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5885.4745 | 95.3133 | 11.49 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5949.2432 | -232.1521 | 12.45 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5949.2432 | 324.9709 | 13.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.606 | 202] 1.5 [DL + RSX] | 6032.0949 | -153.2461 | -75.8214 |
| Bottom | 1.69 | 202] 1.5 [DL + RSX] | 6095.8635 | 163.0564 | 237.1375 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4563.5727 | 17.6336 | 79.1305 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4627.3414 | 237.1375 | 79.2742 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6178.9125 | -172.322 | 12.51 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6178.9125 | 114.1342 | 12.15 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6242.6811 | -258.3735 | 13.16 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6242.6811 | 354.1061 | 13.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.629 | 202] 1.5 [DL + RSX] | 6299.8694 | -141.7207 | -75.4457 |
| Bottom | 1.711 | 202] 1.5 [DL + RSX] | 6363.6381 | 152.0477 | 276.1469 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4746.5239 | 25.9628 | 77.9657 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4810.2926 | 276.1469 | 78.0798 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6463.9943 | -197.4877 | 13.19 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6463.9943 | 148.0048 | 12.88 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6527.7629 | -298.9053 | 13.93 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6527.7629 | 386.8007 | 14.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.665 | 202] 1.5 [DL + RSX] | 6561.1334 | -132.8075 | -117.9394 |
| Bottom | 1.804 | 202] 1.5 [DL + RSX] | 6626.9265 | 162.1358 | 321.6163 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4931.4671 | 66.5264 | 73.9197 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4997.2601 | 321.6163 | 74.0035 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6740.4878 | -243.427 | 13.99 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6740.4878 | 192.014 | 13.67 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6806.2809 | -363.3642 | 14.85 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6806.2809 | 409.7835 | 15.13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.107 | 202] 1.5 [DL + RSX] | 6840.8025 | -267.4696 | -203.3968 |
| Bottom | 2.218 | 202] 1.5 [DL + RSX] | 6925.8274 | 269.9693 | -480.808 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5146.4404 | 144.1417 | 71.7005 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5231.4653 | 466.4553 | 71.7543 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7032.2129 | -310.5965 | 14.94 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7032.2129 | 251.3414 | 14.57 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7117.2378 | -502.4389 | 16.28 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7117.2378 | 488.0862 | 16.19 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P31 | 0 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 0 | 28730 | 0 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.069 | 202] 1.5 [DL + RSX] | 7092.9146 | -230.238 | -380.2065 |
| Bottom | 2.176 | 202] 1.5 [DL + RSX] | 7174.2956 | 232.4299 | 718.1724 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5344.8525 | 339.6055 | 91.8591 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5426.2335 | 718.1724 | 91.8678 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7295.0523 | -425.575 | 16.14 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7295.0523 | 384.9741 | 15.89 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7376.4333 | -585.4359 | 17.27 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7376.4333 | 702.5504 | 18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.407 | 203] 1.5 [DL + RSY] | 747.0355 | -143.8399 | 62.4864 |
| Bottom | 1.76 | 203] 1.5 [DL + RSY] | 789.548 | 122.3403 | 31.1392 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 678.0382 | 194.1286 | -80.998 | 110.2299 | 370.056 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 720.5506 | 127.8119 | -81.3433 | 111.504 | 371.3301 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 911.557 | -82.9562 | 3.68 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 911.557 | 194.1286 | 5.23 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 954.0695 | -81.3861 | 3.78 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 954.0695 | 127.8119 | 4.43 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.242 | 203] 1.5 [DL + RSY] | 988.3556 | -106.8057 | -59.1835 |
| Bottom | 1.232 | 203] 1.5 [DL + RSY] | 1030.8681 | 110.2241 | 42.4819 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 955.891 | 86.4736 | 92.853 | 118.5571 | 378.3832 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 998.4034 | 140.5517 | 93.5908 | 119.8312 | 379.6573 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1185.0686 | -196.3052 | 6.02 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1185.0686 | 86.4736 | 4.49 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1227.581 | -67.7711 | 4.35 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1227.581 | 140.5517 | 5.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.22 | 203] 1.5 [DL + RSY] | 1226.4214 | -113.5723 | -49.2578 |
| Bottom | 1.171 | 203] 1.5 [DL + RSY] | 1501.197 | 112.3065 | 44.0521 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1228.1087 | 105.682 | 93.869 | 124.0195 | 383.8456 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1270.6212 | 150.0238 | 94.5542 | 125.2665 | 385.0926 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1456.9973 | -193.1203 | 6.73 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1456.9973 | 105.682 | 5.52 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1499.5097 | -69.0808 | 5.12 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1499.5097 | 150.0238 | 6.25 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.191 | 202] 1.5 [DL + RSX] | 1728.5572 | -94.717 | -191.2073 |
| Bottom | 1.191 | 203] 1.5 [DL + RSY] | 1805.5771 | 111.8781 | 43.0549 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1496.9008 | 112.4933 | 93.3729 | 131.9038 | 391.7299 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1539.4133 | 153.8241 | 94.0044 | 131.9947 | 391.8208 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1763.0647 | -34.3149 | 5.37 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1728.5572 | 112.4933 | 6.36 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1771.0696 | -74.2482 | 5.95 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1805.5771 | 43.0549 | 5.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.211 | 203] 1.5 [DL + RSY] | 2066.0985 | -112.2988 | -43.7661 |
| Bottom | 1.217 | 203] 1.5 [DL + RSY] | 2108.6109 | 112.1274 | 41.9281 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1762.5482 | 114.8612 | 94.0236 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1805.0606 | 157.7393 | 94.5865 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2066.0985 | -34.2329 | 6.21 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2000.1971 | 114.8612 | 7.15 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2042.7096 | -80.3414 | 6.79 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2108.6109 | 41.9281 | 6.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.274 | 203] 1.5 [DL + RSY] | 2368.4705 | -112.4765 | -43.4334 |
| Bottom | 1.28 | 203] 1.5 [DL + RSY] | 2410.983 | 112.5082 | 40.6339 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2025.6328 | 117.0413 | 94.7653 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2068.1453 | 162.164 | 95.2796 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2368.4705 | -34.36 | 7.06 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2272.5144 | 117.0413 | 7.94 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2315.0268 | -86.6879 | 7.63 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2410.983 | 40.6339 | 7.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.296 | 203] 1.5 [DL + RSY] | 2670.7667 | -112.8573 | -42.6623 |
| Bottom | 1.304 | 203] 1.5 [DL + RSY] | 2713.2791 | 113.1244 | 39.6218 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2286.6533 | 119.1073 | 95.4397 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2329.1658 | 166.7681 | 95.9359 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2670.7667 | -34.3837 | 7.9 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2546.0725 | 119.1073 | 8.73 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2588.5849 | -92.7925 | 8.48 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2713.2791 | 39.6218 | 8.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.373 | 203] 1.5 [DL + RSY] | 2973.5537 | -113.3036 | -41.3849 |
| Bottom | 1.386 | 203] 1.5 [DL + RSY] | 3016.0661 | 113.8597 | 38.9805 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2546.1175 | 120.426 | 95.8872 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2588.6299 | 171.3155 | 96.3831 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2973.5537 | -34.0889 | 8.73 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2821.4296 | 120.426 | 9.51 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2863.9421 | -98.8372 | 9.33 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3016.0661 | 38.9805 | 8.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.4 | 203] 1.5 [DL + RSY] | 3277.3809 | -113.875 | -40.2651 |
| Bottom | 1.415 | 203] 1.5 [DL + RSY] | 3319.8934 | 114.9056 | 38.5687 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2804.5489 | 120.3631 | 96.1501 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2847.0614 | 176.3661 | 96.6413 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3277.3809 | -33.0864 | 9.56 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3099.152 | 120.3631 | 10.28 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3141.6644 | -105.7154 | 10.2 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3319.8934 | 38.5687 | 9.76 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.479 | 203] 1.5 [DL + RSY] | 3582.7118 | -114.1697 | -40.2539 |
| Bottom | 1.494 | 203] 1.5 [DL + RSY] | 3625.2242 | 115.0304 | 41.2874 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3062.4106 | 118.3994 | 96.6142 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3104.923 | 184.272 | 97.081 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3582.7118 | -30.8283 | 10.38 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3379.7504 | 118.3994 | 11.03 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3422.2628 | -110.3371 | 11.04 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3625.2242 | 41.2874 | 10.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.501 | 203] 1.5 [DL + RSY] | 3890.3569 | -116.1747 | -38.0041 |
| Bottom | 1.547 | 203] 1.5 [DL + RSY] | 3932.8693 | 119.5645 | 76.8509 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3320.5177 | 119.2474 | 111.2371 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3363.0301 | 240.0535 | 111.6696 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3890.3569 | -24.0242 | 11.14 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3664.1401 | 119.2474 | 11.83 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3706.6525 | -97.0598 | 11.64 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3706.6525 | 240.0535 | 13.63 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P32 | 5045 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 4445 | 30530 | 5645 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.552 | 203] 1.5 [DL + RSY] | 4199.7829 | -111.6493 | 16.3248 |
| Bottom | 1.639 | 203] 1.5 [DL + RSY] | 4242.2954 | 105.9461 | -246.7057 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3578.3913 | 142.1962 | -162.5109 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3620.9038 | -6.3469 | -162.7813 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3951.802 | -121.7832 | 12.67 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4199.7829 | 16.3248 | 11.89 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4242.2954 | -213.085 | 14.74 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2471.2708 | 85.6112 | 8.05 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.409 | 203] 1.5 [DL + RSY] | 4473.3569 | -100.9561 | 988.5201 |
| Bottom | 1.174 | 203] 1.5 [DL + RSY] | 4537.1256 | 100.9748 | 77.1428 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3804.6063 | 1025.3639 | -363.6668 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3868.375 | 350.452 | -363.7969 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4473.3569 | 988.5201 | 14.39 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4267.6662 | -236.3951 | 9.36 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4537.1256 | 77.1428 | 8.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.205 | 203] 1.5 [DL + RSY] | 4759.8083 | -97.3748 | 52.1654 |
| Bottom | 1.225 | 203] 1.5 [DL + RSY] | 4823.577 | 101.6439 | -38.1066 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4048.1894 | 220.3471 | -116.0596 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4111.9581 | 289.5776 | -116.5186 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4461.514 | -154.5423 | 9.22 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4759.8083 | 52.1654 | 9.14 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4823.577 | -9.8513 | 8.99 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4525.2826 | 289.5776 | 10.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.257 | 203] 1.5 [DL + RSY] | 5049.6285 | -95.0786 | -58.0491 |
| Bottom | 1.274 | 203] 1.5 [DL + RSY] | 5113.3972 | 100.167 | -16.6638 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4294.3399 | 150.4089 | 109.6387 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4358.1085 | 322.7968 | 110.1978 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5049.6285 | -30.2471 | 9.54 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4724.4396 | 150.4089 | 9.68 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5113.3972 | -16.6638 | 9.57 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5113.3972 | 8.5485 | 9.52 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.306 | 203] 1.5 [DL + RSY] | 5340.54 | -93.2662 | -36.8836 |
| Bottom | 1.328 | 203] 1.5 [DL + RSY] | 5404.3087 | 99.1607 | 12.8514 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4541.7119 | 166.7884 | 105.5801 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4605.4806 | 346.3998 | 106.218 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5340.54 | -11.0609 | 9.96 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4990.6833 | 166.7884 | 10.27 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5404.3087 | -6.7758 | 10.05 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5404.3087 | 12.8514 | 10.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.354 | 203] 1.5 [DL + RSY] | 5632.6654 | -90.8962 | -24.8433 |
| Bottom | 1.382 | 203] 1.5 [DL + RSY] | 5696.434 | 98.0162 | 12.9389 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4791.0028 | 166.1616 | 102.6637 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4854.7715 | 369.307 | 103.3682 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5632.6654 | -4.8206 | 10.46 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5260.417 | 166.1616 | 10.77 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5696.434 | -4.9726 | 10.58 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5696.434 | 12.9389 | 10.63 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.403 | 203] 1.5 [DL + RSY] | 5925.8331 | -87.9587 | -20.3461 |
| Bottom | 1.436 | 203] 1.5 [DL + RSY] | 5989.6018 | 96.553 | 13.7348 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5042.6969 | 160.2793 | 100.9529 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5106.4656 | 399.3192 | 101.6932 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5925.8331 | -2.2298 | 10.99 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5533.5813 | 160.2793 | 11.24 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5989.6018 | -3.9896 | 11.12 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5989.6018 | 13.7348 | 11.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.463 | 203] 1.5 [DL + RSY] | 6219.9628 | -84.5006 | 1.8046 |
| Bottom | 1.491 | 203] 1.5 [DL + RSY] | 6283.7314 | 95.1185 | 18.1507 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5297.4429 | 164.6564 | 99.6379 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5361.2116 | 441.9884 | 100.3637 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6219.9628 | -16.3159 | 11.62 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6219.9628 | 1.8046 | 11.53 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6283.7314 | -1.4926 | 11.65 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6283.7314 | 18.1507 | 11.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.524 | 203] 1.5 [DL + RSY] | 6514.0593 | -79.4576 | 9.1461 |
| Bottom | 1.549 | 203] 1.5 [DL + RSY] | 6577.828 | 91.4373 | -0.747 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5555.2821 | 194.3931 | -98.8118 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5619.0507 | 483.9337 | -99.4597 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6514.0593 | -10.8654 | 12.13 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6514.0593 | 9.1461 | 12.12 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6577.828 | -0.747 | 12.19 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6153.6011 | 483.9337 | 14.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.588 | 203] 1.5 [DL + RSY] | 6811.8497 | -77.0265 | -2.854 |
| Bottom | 1.623 | 203] 1.5 [DL + RSY] | 6877.6428 | 98.3025 | 0.474 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5819.9686 | 242.6172 | 95.4258 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5885.7616 | 571.183 | 95.9638 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6811.8497 | -2.854 | 12.63 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6376.7673 | 242.6172 | 13.31 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6442.5604 | -534.5982 | 15.23 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6877.6428 | 36.1109 | 12.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.031 | 203] 1.5 [DL + RSY] | 7103.3051 | -243.2286 | -54.7405 |
| Bottom | 2.177 | 202] 1.5 [DL + RSX] | 6741.0869 | 228.7693 | 931.0015 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6090.9731 | 318.0033 | 138.6162 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6175.998 | 931.0015 | 138.9991 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7103.3051 | -21.5571 | 13.29 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6656.062 | 318.0033 | 14.29 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6741.0869 | -844.6159 | 17.7 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7188.33 | 57.2203 | 13.66 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P32 | 4745 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 3845 | 30530 | 5645 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.039 | 202] 1.5 [DL + RSX] | 6939.2399 | -202.9872 | -748.6943 |
| Bottom | 2.275 | 202] 1.5 [DL + RSX] | 7020.6208 | 205.1791 | 1394.0306 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6373.3953 | 667.1674 | 178.247 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6454.7763 | 1394.0306 | 178.3202 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7395.7526 | -30.6341 | 13.88 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6939.2399 | 667.1674 | 16.97 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7020.6208 | -1390.163 | 21.58 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7020.6208 | 1394.0306 | 21.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.958 | 202] 1.5 [DL + RSX] | 1296.0022 | 73.2265 | 210.05 |
| Bottom | 0.803 | 202] 1.5 [DL + RSX] | 1338.5146 | -71.5828 | 63.6562 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1133.0482 | 210.05 | -72.2467 | 127.797 | 387.6231 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1175.5606 | 63.6562 | -72.157 | 129.1115 | 388.9376 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1364.3793 | 189.4876 | 6.42 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1406.8918 | -26.2003 | 4.27 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1406.8918 | 70.6291 | 4.89 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.889 | 202] 1.5 [DL + RSX] | 1490.8757 | 78.0174 | -79.4637 |
| Bottom | 0.882 | 202] 1.5 [DL + RSX] | 1533.3881 | -75.8969 | 76.8831 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1273.3616 | 2.6506 | 48.758 | 132.1356 | 391.9617 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1315.8741 | 76.8831 | 48.6884 | 133.4501 | 393.2762 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1542.6659 | -103.0756 | 5.72 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1542.6659 | 26.2624 | 4.65 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1585.1784 | -19.1906 | 4.67 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1585.1784 | 82.4354 | 5.55 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.941 | 202] 1.5 [DL + RSX] | 1692.6404 | 80.9118 | -66.2442 |
| Bottom | 0.947 | 202] 1.5 [DL + RSX] | 1735.1529 | -79.0739 | 79.4639 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1380.2298 | 39.4505 | 46.3374 | 135.44 | 395.2661 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1422.7422 | 88.4025 | 46.8237 | 136.7545 | 396.5806 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1724.3176 | -99.1901 | 6.17 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1724.3176 | 39.4505 | 5.34 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1766.83 | -20.3037 | 5.19 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1766.83 | 88.4025 | 6.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.999 | 202] 1.5 [DL + RSX] | 1899.1004 | 83.3661 | -64.9012 |
| Bottom | 1.008 | 202] 1.5 [DL + RSX] | 1941.6129 | -81.7111 | 79.3181 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1539.6829 | 41.769 | 45.2151 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1582.1954 | 89.9995 | 45.7101 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1907.84 | -97.3486 | 6.65 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1907.84 | 41.769 | 5.88 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1950.3524 | -22.1699 | 5.73 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1950.3524 | 89.9995 | 6.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 900 | 0.0025 | 0.0031 | 205] 1.2 [DL + LL + RSY] | 1863.2521 | 19.5563 | -82.8841 | 360000 |
| Bottom | 900 | 0.0025 | 0.0031 | 205] 1.2 [DL + LL + RSY] | 1897.262 | -32.1518 | -12.8784 | 360000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1699.7389 | 41.0294 | 45.2381 | 122.9539 | 382.78 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1742.2513 | 91.2039 | 45.7332 | 123.9402 | 383.7663 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2109.5793 | -65.8436 | 6.77 | 6 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2092.5232 | 41.0294 | 6.38 | 6 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2152.0918 | -11.3515 | 6.14 | 6 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2152.0918 | 79.0705 | 7.08 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.117 | 202] 1.5 [DL + RSX] | 2323.7318 | 87.7551 | -66.8343 |
| Bottom | 1.127 | 202] 1.5 [DL + RSX] | 2366.2442 | -86.2079 | 78.7787 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1860.3572 | 39.4393 | 45.4145 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1902.8696 | 92.574 | 45.9013 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2323.7318 | -66.8343 | 7.38 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2323.7318 | 8.4665 | 6.57 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2366.2442 | -10.6463 | 6.72 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2366.2442 | 78.7787 | 7.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.186 | 202] 1.5 [DL + RSX] | 2541.2895 | 89.5392 | -67.7033 |
| Bottom | 1.196 | 202] 1.5 [DL + RSX] | 2583.8019 | -88.1318 | 78.2817 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2021.4474 | 36.9863 | 45.5778 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2063.9599 | 94.4016 | 46.0367 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2541.2895 | -67.7033 | 8 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2541.2895 | 7.9712 | 7.17 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2583.8019 | -9.3697 | 7.31 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2583.8019 | 78.2817 | 8.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.254 | 202] 1.5 [DL + RSX] | 2761.9638 | 90.9744 | -68.4113 |
| Bottom | 1.265 | 202] 1.5 [DL + RSX] | 2804.4763 | -89.8454 | 77.5533 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2182.8713 | 33.7248 | 45.7018 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2225.3837 | 96.9385 | 46.1131 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2761.9638 | -68.4113 | 8.62 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2761.9638 | 7.3098 | 7.77 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2804.4763 | -7.5071 | 7.89 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2804.4763 | 77.5533 | 8.87 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.321 | 202] 1.5 [DL + RSX] | 2985.4133 | 91.8943 | -68.9864 |
| Bottom | 1.331 | 202] 1.5 [DL + RSX] | 3027.9257 | -90.9822 | 75.7737 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2192.5433 | 6.4891 | 45.5381 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2386.9516 | 99.2604 | 45.7998 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2985.4133 | -68.9864 | 9.25 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2985.4133 | 6.4891 | 8.38 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3027.9257 | -5.7572 | 8.49 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3027.9257 | 75.7737 | 9.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.388 | 202] 1.5 [DL + RSX] | 3211.3172 | 92.7066 | -70.5376 |
| Bottom | 1.403 | 202] 1.5 [DL + RSX] | 3253.8297 | -93.2054 | 73.5323 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2505.9607 | 25.0728 | 45.5049 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2548.4732 | 102.5293 | 45.8036 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3211.3172 | -70.5376 | 9.9 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3211.3172 | 5.0386 | 8.99 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3253.8297 | -1.4228 | 9.06 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3253.8297 | 73.5323 | 10.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.159 | 202] 1.5 [DL + RSX] | 3438.8087 | 90.5387 | -73.2074 |
| Bottom | 1.178 | 202] 1.5 [DL + RSX] | 3481.3212 | -89.0577 | 108.3315 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2666.8442 | 21.0856 | 59.9107 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2709.3567 | 151.2038 | 60.1475 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3438.8087 | -73.2074 | 10.57 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3438.8087 | 6.1208 | 9.64 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3242.1028 | -1.7425 | 9.03 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3481.3212 | 108.3315 | 11.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P33 | 8575 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 8575 | 29330 | 8575 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.217 | 202] 1.5 [DL + RSX] | 3666.6095 | 95.4437 | 48.917 |
| Bottom | 1.353 | 202] 1.5 [DL + RSX] | 3709.1219 | -108.3634 | -229.2057 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2539.1086 | 48.917 | -88.8792 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2581.621 | -119.4929 | -88.8537 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3666.6095 | -38.2742 | 10.72 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3666.6095 | 48.917 | 10.86 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3709.1219 | -229.2057 | 13.49 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.825 | 202] 1.5 [DL + RSX] | 2671.7279 | 201.1573 | 861.8876 |
| Bottom | 1.407 | 202] 1.5 [DL + RSX] | 4010.4943 | -189.6741 | 96.756 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2671.7279 | 861.8876 | -258.9334 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2735.4965 | 96.756 | -258.9008 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3946.7256 | 861.8876 | 12.63 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3664.0771 | -120.7622 | 7.53 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4010.4943 | 96.756 | 8.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.338 | 202] 1.5 [DL + RSX] | 4254.4834 | 163.7353 | -118.3467 |
| Bottom | 1.364 | 202] 1.5 [DL + RSX] | 4318.2521 | -171.4512 | 73.2481 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3223.4175 | 66.2003 | 62.3493 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3287.1862 | 225.3818 | 62.5711 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4254.4834 | -118.3467 | 8.61 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4254.4834 | 23.8892 | 8.03 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4318.2521 | -13.0991 | 8.08 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4318.2521 | 73.2481 | 8.45 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.407 | 202] 1.5 [DL + RSX] | 4556.28 | 168.5951 | -117.9655 |
| Bottom | 1.42 | 202] 1.5 [DL + RSX] | 4620.0487 | -171.1357 | 92.1249 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3423.781 | 54.3358 | 77.3472 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3487.5496 | 260.28 | 77.916 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4556.28 | -25.735 | 8.6 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4101.3914 | 54.3358 | 7.93 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4165.16 | -153.0105 | 8.66 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4620.0487 | 92.1249 | 9.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.432 | 202] 1.5 [DL + RSX] | 4854.5942 | 163.112 | -88.4258 |
| Bottom | 1.458 | 202] 1.5 [DL + RSX] | 4918.3629 | -167.5173 | 87.8059 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3621.0912 | 86.0626 | 67.0388 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3684.8599 | 270.7051 | 67.8069 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4854.5942 | -88.4258 | 9.54 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4854.5942 | 1.0698 | 9 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4406.1038 | -162.507 | 9.16 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4918.3629 | 87.8059 | 9.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.463 | 202] 1.5 [DL + RSX] | 5147.8024 | 157.5671 | -82.8715 |
| Bottom | 1.492 | 202] 1.5 [DL + RSX] | 5211.571 | -163.1784 | 80.7935 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3814.5705 | 94.856 | 63.3063 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3878.3391 | 281.1467 | 64.1659 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5147.8024 | -82.8715 | 10.04 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5147.8024 | 6.9799 | 9.58 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4640.2267 | -181.332 | 9.71 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5211.571 | 80.7935 | 10.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.488 | 202] 1.5 [DL + RSX] | 5434.8701 | 150.3836 | -82.2143 |
| Bottom | 1.523 | 202] 1.5 [DL + RSX] | 5498.6388 | -157.8342 | 79.3379 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4004.2162 | 106.1641 | 61.9554 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4067.9849 | 300.5407 | 62.8342 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5434.8701 | -82.2143 | 10.57 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5434.8701 | 8.4504 | 10.12 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4866.9733 | -205.2889 | 10.28 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5498.6388 | 79.3379 | 10.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.511 | 202] 1.5 [DL + RSX] | 5714.3246 | 140.7096 | -82.0005 |
| Bottom | 1.548 | 202] 1.5 [DL + RSX] | 5778.0933 | -149.3287 | 92.3038 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4189.8185 | 130.9341 | 62.4476 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4253.5872 | 336.2445 | 63.2555 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5714.3246 | -82.0005 | 11.09 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5714.3246 | 14.1311 | 10.67 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5085.6589 | -231.3451 | 10.85 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5778.0933 | 92.3038 | 11.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.54 | 202] 1.5 [DL + RSX] | 5984.7625 | 131.438 | -79.0773 |
| Bottom | 1.602 | 202] 1.5 [DL + RSX] | 6048.5311 | -147.9084 | 119.1978 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4371.8674 | 177.7977 | 61.6784 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4435.636 | 385.4635 | 62.3444 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5984.7625 | -79.0773 | 11.57 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5984.7625 | 31.9583 | 11.28 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5296.4893 | -263.7291 | 11.44 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6048.5311 | 119.1978 | 11.94 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.517 | 202] 1.5 [DL + RSX] | 6241.4257 | 101.9115 | -82.1657 |
| Bottom | 1.616 | 202] 1.5 [DL + RSX] | 6307.2187 | 131.2903 | -148.0974 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4545.6853 | 241.0252 | -46.8085 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4611.4783 | 306.9855 | -47.3575 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6241.4257 | -82.1657 | 12.07 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6241.4257 | 61.3362 | 11.94 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6307.2187 | -148.0974 | 12.59 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6307.2187 | 29.6182 | 11.86 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.157 | 202] 1.5 [DL + RSX] | 6742.6663 | 290.7029 | 128.1442 |
| Bottom | 2.221 | 202] 1.5 [DL + RSX] | 6827.6912 | 293.2026 | -245.4871 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4989.4333 | 338.0174 | -68.4432 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5074.4582 | 362.4505 | -68.7694 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6742.6663 | -33.7754 | 12.69 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6742.6663 | 128.1442 | 13.28 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6827.6912 | -245.4871 | 14.16 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6827.6912 | 61.1457 | 13.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P33 | 8575 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 8575 | 28730 | 8575 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.094 | 202] 1.5 [DL + RSX] | 7279.8357 | -241.7459 | 198.6915 |
| Bottom | 2.136 | 202] 1.5 [DL + RSX] | 7361.2167 | 243.9378 | 283.757 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5486.6345 | 460.6445 | -63.7694 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5568.0154 | 706.3223 | -63.8229 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7279.8357 | -99.8692 | 14.1 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7279.8357 | 198.6915 | 14.71 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7361.2167 | -198.996 | 14.86 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7361.2167 | 283.757 | 15.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.968 | 202] 1.5 [DL + RSX] | 1300.4547 | -74.9569 | 204.6159 |
| Bottom | 0.806 | 202] 1.5 [DL + RSX] | 1342.9672 | 72.5156 | 58.1887 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1142.257 | 204.6159 | -70.9927 | 128.0817 | 387.9078 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1184.7694 | 58.1887 | -70.8985 | 129.3962 | 389.2223 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1395.1927 | 183.8555 | 6.43 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1437.7051 | -29.4513 | 4.4 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1437.7051 | 66.767 | 4.92 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.899 | 202] 1.5 [DL + RSX] | 1498.7977 | -78.7124 | -84.6541 |
| Bottom | 0.887 | 202] 1.5 [DL + RSX] | 1541.3101 | 76.4643 | 76.4374 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1289.6234 | -4.3084 | 50.3311 | 132.6384 | 392.4645 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1332.1359 | 76.4374 | 50.257 | 133.9529 | 393.779 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1579.9661 | -109.7739 | 5.91 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1579.9661 | 20.8114 | 4.68 | 5 |
| Bottom–Left | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1622.4786 | -17.8136 | 4.75 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1622.4786 | 83.4804 | 5.67 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.949 | 202] 1.5 [DL + RSX] | 1704.9624 | -81.7983 | -66.6383 |
| Bottom | 0.954 | 202] 1.5 [DL + RSX] | 1747.4748 | 79.7766 | 78.8647 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1370.9683 | 38.6644 | 47.1774 | 135.1536 | 394.9797 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1413.4807 | 89.3103 | 47.6694 | 136.4682 | 396.2942 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1768.2299 | -101.3643 | 6.32 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1768.2299 | 38.6644 | 5.45 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1810.7424 | -19.1633 | 5.3 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1810.7424 | 89.3103 | 6.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.007 | 202] 1.5 [DL + RSX] | 1916.2414 | -84.0661 | -65.4379 |
| Bottom | 1.015 | 202] 1.5 [DL + RSX] | 1958.7538 | 82.3724 | 78.6533 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1534.017 | 40.961 | 46.1146 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1576.5294 | 90.7725 | 46.6207 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1958.428 | -99.7357 | 6.83 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1958.428 | 40.961 | 6.01 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2000.9404 | -20.9943 | 5.85 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2000.9404 | 90.7725 | 6.82 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.067 | 202] 1.5 [DL + RSX] | 2131.6757 | -86.2327 | -66.4286 |
| Bottom | 1.075 | 202] 1.5 [DL + RSX] | 2174.1882 | 84.6442 | 78.4814 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1697.3315 | 40.173 | 46.222 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1739.8439 | 92.0176 | 46.73 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2149.7884 | -100.2703 | 7.36 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2149.7884 | 40.173 | 6.53 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2192.3009 | -22.1442 | 6.4 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2192.3009 | 92.0176 | 7.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.127 | 202] 1.5 [DL + RSX] | 2350.8059 | -88.1821 | -67.3335 |
| Bottom | 1.136 | 202] 1.5 [DL + RSX] | 2393.3184 | 86.7025 | 78.1852 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1860.8599 | 38.6264 | 46.4142 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1903.3724 | 93.4478 | 46.9127 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2350.8059 | -67.3335 | 7.47 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2350.8059 | 5.9697 | 6.61 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2393.3184 | -7.8438 | 6.76 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2393.3184 | 78.1852 | 7.73 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.197 | 202] 1.5 [DL + RSX] | 2573.3186 | -89.8594 | -68.174 |
| Bottom | 1.207 | 202] 1.5 [DL + RSX] | 2615.831 | 88.5424 | 77.6086 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2024.5329 | 36.1471 | 46.5906 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2067.0453 | 95.4198 | 47.0578 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2573.3186 | -68.174 | 8.09 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2573.3186 | 5.5511 | 7.23 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2615.831 | -6.5593 | 7.36 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2615.831 | 77.6086 | 8.34 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.266 | 202] 1.5 [DL + RSX] | 2798.9191 | -91.2152 | -68.9008 |
| Bottom | 1.276 | 202] 1.5 [DL + RSX] | 2841.4315 | 90.1847 | 76.7316 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2188.2587 | 32.8641 | 46.7163 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2230.7711 | 98.1701 | 47.1317 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2798.9191 | -68.9008 | 8.73 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2798.9191 | 4.9016 | 7.84 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2841.4315 | -4.7367 | 7.96 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2841.4315 | 76.7316 | 8.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.333 | 202] 1.5 [DL + RSX] | 3027.2831 | -92.0952 | -69.5357 |
| Bottom | 1.344 | 202] 1.5 [DL + RSX] | 3069.7956 | 91.2848 | 74.8411 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2351.9172 | 29.0722 | 46.4793 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2394.4296 | 100.7947 | 46.8334 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3027.2831 | -69.5357 | 9.37 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3027.2831 | 4.0287 | 8.47 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3069.7956 | -3.0183 | 8.57 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3069.7956 | 74.8411 | 9.57 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.402 | 202] 1.5 [DL + RSX] | 3258.119 | -92.8955 | -71.0842 |
| Bottom | 1.417 | 202] 1.5 [DL + RSX] | 3300.6315 | 93.4254 | 72.5932 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2515.4098 | 24.4097 | 46.5211 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2557.9223 | 104.3333 | 46.8178 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3258.119 | -71.0842 | 10.04 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3258.119 | 2.5285 | 9.09 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3150.0361 | -30.6841 | 9.18 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3300.6315 | 72.5932 | 10.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.172 | 202] 1.5 [DL + RSX] | 3490.6333 | -90.9122 | -73.6334 |
| Bottom | 1.191 | 202] 1.5 [DL + RSX] | 3533.1458 | 89.506 | 107.0829 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2678.2955 | 20.6741 | 61.179 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2720.8079 | 153.8425 | 61.4187 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3490.6333 | -73.6334 | 10.72 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3490.6333 | 3.3778 | 9.74 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3338.7555 | -2.6744 | 9.31 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3533.1458 | 107.0829 | 11.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P34 | 18765 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 18765 | 29330 | 18765 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.23 | 202] 1.5 [DL + RSX] | 3723.5151 | -95.7746 | 46.9458 |
| Bottom | 1.367 | 202] 1.5 [DL + RSX] | 3766.0275 | 108.3974 | -232.5879 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2598.8729 | 46.9458 | -89.4475 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2641.3853 | -127.0035 | -89.4214 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3723.5151 | -38.8895 | 10.88 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3723.5151 | 46.9458 | 11 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3766.0275 | -232.5879 | 13.69 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.829 | 202] 1.5 [DL + RSX] | 2737.7808 | -202.9249 | 865.4985 |
| Bottom | 1.426 | 202] 1.5 [DL + RSX] | 4073.9225 | 191.5476 | 103.375 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2737.7808 | 865.4985 | -257.5366 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2801.5495 | 103.375 | -257.5045 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4010.1539 | 865.4985 | 12.77 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3779.0466 | -120.836 | 7.74 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4073.9225 | 103.375 | 8.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.353 | 202] 1.5 [DL + RSX] | 4323.9112 | -164.9003 | -116.4915 |
| Bottom | 1.382 | 202] 1.5 [DL + RSX] | 4387.6799 | 173.0142 | 75.8844 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3238.0681 | 70.2075 | 66.0856 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3301.8368 | 234.9915 | 66.3587 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4323.9112 | -116.4915 | 8.73 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4323.9112 | 23.8078 | 8.15 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4387.6799 | -6.1412 | 8.16 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4387.6799 | 75.8844 | 8.59 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.423 | 202] 1.5 [DL + RSX] | 4631.0256 | -169.3319 | -118.1877 |
| Bottom | 1.437 | 202] 1.5 [DL + RSX] | 4694.7943 | 172.2641 | 91.9094 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3438.1537 | 54.7538 | 80.9843 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3501.9223 | 266.645 | 81.5693 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4631.0256 | -26.3198 | 8.74 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4237.1564 | 54.7538 | 8.18 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4300.9251 | -154.9563 | 8.92 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4694.7943 | 91.9094 | 9.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.449 | 202] 1.5 [DL + RSX] | 4934.0838 | -163.668 | -90.6507 |
| Bottom | 1.475 | 202] 1.5 [DL + RSX] | 4997.8525 | 168.385 | 87.5489 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3634.7123 | 83.22 | 71.0901 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3698.481 | 276.5183 | 71.8579 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4934.0838 | -0.9183 | 9.14 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4486.9728 | 83.22 | 8.82 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4550.7415 | -164.5996 | 9.44 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4997.8525 | 87.5489 | 9.8 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.479 | 202] 1.5 [DL + RSX] | 5231.5014 | -157.934 | -84.2841 |
| Bottom | 1.509 | 202] 1.5 [DL + RSX] | 5295.2701 | 163.8138 | 80.6269 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3826.9988 | 91.3837 | 66.9098 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3890.7675 | 286.458 | 67.7612 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5231.5014 | -84.2841 | 10.21 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5231.5014 | 5.4227 | 9.72 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4792.7823 | -183.7114 | 10.01 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5295.2701 | 80.6269 | 10.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.504 | 202] 1.5 [DL + RSX] | 5522.2452 | -150.6124 | -82.6469 |
| Bottom | 1.54 | 202] 1.5 [DL + RSX] | 5586.0139 | 158.3637 | 79.4134 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4015.0248 | 102.3762 | 65.0317 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4078.7934 | 305.3474 | 65.896 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5522.2452 | -82.6469 | 10.74 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5522.2452 | 7.2382 | 10.27 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5026.4842 | -208.2654 | 10.59 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5586.0139 | 79.4134 | 10.83 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.529 | 202] 1.5 [DL + RSX] | 5804.7976 | -140.6567 | -81.4248 |
| Bottom | 1.565 | 202] 1.5 [DL + RSX] | 5868.5663 | 149.2983 | 92.7309 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4198.5863 | 127.4077 | 65.0101 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4262.3549 | 340.7497 | 65.8006 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5804.7976 | -81.4248 | 11.25 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5804.7976 | 13.0714 | 10.83 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5251.1019 | -235.1876 | 11.18 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5868.5663 | 92.7309 | 11.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.559 | 202] 1.5 [DL + RSX] | 6077.7368 | -131.804 | -77.426 |
| Bottom | 1.624 | 202] 1.5 [DL + RSX] | 6141.5055 | 149.6242 | 116.5704 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4378.2482 | 175.5091 | 62.4135 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4442.0169 | 386.0179 | 63.0642 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6077.7368 | -77.426 | 11.73 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6077.7368 | 31.2022 | 11.45 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6141.5055 | -0.1014 | 11.37 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6141.5055 | 116.5704 | 12.09 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.528 | 202] 1.5 [DL + RSX] | 6335.8106 | -99.0317 | -80.9442 |
| Bottom | 1.651 | 202] 1.5 [DL + RSX] | 6401.6037 | -137.4396 | -154.049 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4548.9845 | 237.0674 | -49.7689 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4614.7775 | 302.1983 | -50.3045 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 6335.8106 | -80.9442 | 12.23 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6335.8106 | 57.878 | 12.09 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5670.2455 | -433.9807 | 13.18 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6401.6037 | 22.2666 | 11.99 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.163 | 202] 1.5 [DL + RSX] | 6814.5314 | 289.2634 | 135.8864 |
| Bottom | 2.225 | 202] 1.5 [DL + RSX] | 6899.5562 | 291.7632 | -247.151 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4969.9981 | 348.2606 | -71.5034 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5055.023 | 365.3019 | -71.822 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6814.5314 | -23.1171 | 12.76 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6814.5314 | 135.8864 | 13.46 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6899.5562 | -247.151 | 14.3 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6899.5562 | 60.2991 | 13.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P34 | 18765 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 18765 | 28730 | 18765 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.133 | 202] 1.5 [DL + RSX] | 7343.4039 | 250.4816 | 196.852 |
| Bottom | 2.176 | 202] 1.5 [DL + RSX] | 7424.7848 | 252.6735 | 283.9635 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5456.3597 | 464.2127 | -64.4814 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 5537.7406 | 713.2736 | -64.534 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7343.4039 | -99.5386 | 14.21 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7343.4039 | 196.852 | 14.81 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7424.7848 | -200.5152 | 14.99 | 5 |
| Botttom–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7424.7848 | 283.9635 | 15.5 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.326 | 203] 1.5 [DL + RSY] | 819.3407 | -143.8074 | -82.7401 |
| Bottom | 1.631 | 203] 1.5 [DL + RSY] | 861.8531 | 122.4534 | -23.801 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 755.2047 | 64.0724 | 90.1514 | 112.5426 | 372.3687 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 797.7171 | 89.4186 | 90.4962 | 113.8167 | 373.6428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 990.0999 | -215.4878 | 5.74 | 5 |
| Top–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 990.0999 | 64.0724 | 3.64 | 5 |
| Bottom–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1032.6124 | -121.809 | 4.56 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1032.6124 | 89.4186 | 4.11 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.22 | 203] 1.5 [DL + RSY] | 1050.7677 | -108.0588 | 60.808 |
| Bottom | 1.206 | 203] 1.5 [DL + RSY] | 1093.2801 | 111.0441 | -38.4694 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1025.25 | 198.4612 | -91.9959 | 120.6358 | 380.4619 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1067.7625 | 72.3516 | -92.7351 | 121.9099 | 381.736 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1256.4079 | -84.4086 | 4.66 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1256.4079 | 198.4612 | 6.25 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1298.9203 | -136.7513 | 5.51 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 1298.9203 | 72.3516 | 4.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.21 | 203] 1.5 [DL + RSY] | 1279.3444 | -114.6434 | 49.3084 |
| Bottom | 1.184 | 203] 1.5 [DL + RSY] | 1574.7374 | 113.2551 | -42.5642 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1290.0694 | 193.4638 | -92.972 | 125.837 | 385.6631 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1332.5818 | 72.141 | -93.6564 | 127.084 | 386.9101 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1521.5 | -106.1347 | 5.7 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1521.5 | 193.4638 | 6.91 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1564.0124 | -147.845 | 6.4 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1564.0124 | 72.141 | 5.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.207 | 203] 1.5 [DL + RSY] | 1832.1538 | -113.3133 | 44.0829 |
| Bottom | 1.206 | 203] 1.5 [DL + RSY] | 1874.6663 | 113.0185 | -42.17 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1551.7207 | 190.3982 | -92.3996 | 131.9947 | 391.8208 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1594.2331 | 76.3127 | -93.0308 | 131.9947 | 391.8208 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1786.4912 | -114.1385 | 6.55 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1832.1538 | 44.0829 | 5.7 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1874.6663 | -34.126 | 5.68 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1829.0036 | 76.3127 | 6.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.233 | 203] 1.5 [DL + RSY] | 2131.0013 | -113.7011 | 42.5881 |
| Bottom | 1.239 | 203] 1.5 [DL + RSY] | 2173.5138 | 113.4202 | -40.9014 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1810.452 | 191.2207 | -92.9252 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 1852.9645 | 81.9912 | -93.488 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2051.8083 | -117.4109 | 7.33 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2131.0013 | 42.5881 | 6.51 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2173.5138 | -34.072 | 6.51 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2094.3207 | 81.9912 | 6.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.295 | 203] 1.5 [DL + RSY] | 2429.42 | -113.9843 | 41.4929 |
| Bottom | 1.301 | 203] 1.5 [DL + RSY] | 2471.9325 | 113.932 | -39.5305 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2066.7966 | 192.763 | -93.5967 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2109.309 | 88.1594 | -94.111 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2318.0201 | -120.045 | 8.11 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2429.42 | 41.4929 | 7.32 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2471.9325 | -33.9005 | 7.34 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2360.5325 | 88.1594 | 7.78 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.316 | 203] 1.5 [DL + RSY] | 2727.9601 | -114.4407 | 40.1843 |
| Bottom | 1.325 | 203] 1.5 [DL + RSY] | 2770.4726 | 114.6486 | -38.4955 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2321.205 | 193.8472 | -94.2217 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2363.7175 | 94.2288 | -94.718 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2585.6533 | -122.3712 | 8.88 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2727.9601 | 40.1843 | 8.14 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2770.4726 | -33.5297 | 8.16 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2628.1658 | 94.2288 | 8.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.394 | 203] 1.5 [DL + RSY] | 3027.1511 | -114.9383 | 38.6065 |
| Bottom | 1.407 | 203] 1.5 [DL + RSY] | 3069.6636 | 115.4542 | -37.5634 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2574.1395 | 193.5115 | -94.6386 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2616.652 | 100.3651 | -95.1345 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 2855.2264 | -123.8126 | 9.65 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3027.1511 | 38.6065 | 8.94 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3069.6636 | -32.8332 | 8.98 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2897.7388 | 100.3651 | 9.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.42 | 203] 1.5 [DL + RSY] | 3327.5028 | -115.5359 | 37.3285 |
| Bottom | 1.435 | 203] 1.5 [DL + RSY] | 3370.0152 | 116.5179 | -36.7723 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2826.0812 | 191.3881 | -94.8794 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2868.5936 | 107.4939 | -95.3706 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3127.2612 | -123.7171 | 10.41 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3327.5028 | 37.3285 | 9.76 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3370.0152 | -31.3871 | 9.8 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3169.7737 | 107.4939 | 10.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.497 | 203] 1.5 [DL + RSY] | 3629.4403 | -115.8767 | 37.3761 |
| Bottom | 1.513 | 203] 1.5 [DL + RSY] | 3671.9527 | 116.7238 | -39.643 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3077.4583 | 187.4049 | -95.1776 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3119.9707 | 113.1904 | -95.6447 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3402.2223 | -121.4844 | 11.14 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3629.4403 | 37.3761 | 10.6 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3671.9527 | -29.9117 | 10.62 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3444.7347 | 113.1904 | 11.14 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.519 | 203] 1.5 [DL + RSY] | 3933.7109 | -117.8089 | 36.7875 |
| Bottom | 1.565 | 203] 1.5 [DL + RSY] | 3976.2233 | 121.0613 | -76.8436 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3329.0255 | 180.2746 | -109.9316 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3371.538 | 100.8427 | -110.365 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3680.9474 | -120.9998 | 11.91 | 5 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3933.7109 | 36.7875 | 11.44 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 3723.4599 | -237.8227 | 13.65 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 3723.4599 | 100.8427 | 11.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P35 | 22295 | 30530 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 22895 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.57 | 203] 1.5 [DL + RSY] | 4239.7272 | -113.5053 | -18.1737 |
| Bottom | 1.656 | 203] 1.5 [DL + RSY] | 4282.2396 | 107.7891 | 243.8376 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3580.2844 | 121.8222 | 162.7044 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3622.7969 | 452.9992 | 162.9738 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4239.7272 | -2.2885 | 11.81 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3962.8706 | 121.8222 | 12.7 | 5 |
| Bottom–Left | Leg 1 | 300 | 206] [0.9 DL + 1.5 RSX] | 2479.7471 | -86.5743 | 8.09 | 5 |
| Botttom–Right | Leg 1 | 450 | 206] [0.9 DL + 1.5 RSX] | 4282.2396 | 243.8376 | 15.28 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.436 | 203] 1.5 [DL + RSY] | 4517.1647 | -104.7206 | -1001.3583 |
| Bottom | 1.193 | 203] 1.5 [DL + RSY] | 4580.9334 | 104.4828 | -85.6093 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3807.4571 | -715.9736 | 361.2628 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3871.2258 | 229.6424 | 361.3822 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4517.1647 | -739.3191 | 12.93 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4580.9334 | -41.9232 | 8.74 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4280.9643 | 229.6424 | 9.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.219 | 203] 1.5 [DL + RSY] | 4807.6751 | -99.0024 | -58.339 |
| Bottom | 1.237 | 203] 1.5 [DL + RSY] | 4871.4438 | 103.7051 | 23.818 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4052.4024 | 149.2608 | 112.3902 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4116.1711 | 324.8782 | 112.8505 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4807.6751 | -15.6493 | 9 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4477.5498 | 149.2608 | 9.21 | 5 |
| Bottom–Left | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4541.3185 | -299.5959 | 10.26 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4871.4438 | 23.818 | 9.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.27 | 203] 1.5 [DL + RSY] | 5101.2634 | -97.2596 | 45.0198 |
| Bottom | 1.289 | 203] 1.5 [DL + RSY] | 5165.0321 | 102.1682 | -16.7861 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4299.6682 | 228.8958 | -108.0479 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4363.4369 | 320.3466 | -108.6087 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4742.8651 | -158.9439 | 9.76 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5101.2634 | 45.0198 | 9.72 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5165.0321 | -16.7861 | 9.67 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5165.0321 | 6.8097 | 9.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.319 | 203] 1.5 [DL + RSY] | 5395.7513 | -95.0737 | 27.8153 |
| Bottom | 1.345 | 203] 1.5 [DL + RSY] | 5459.52 | 100.8695 | -19.9449 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4548.0414 | 206.679 | -104.1184 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4611.8101 | 331.3599 | -104.7583 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5011.2967 | -173.7901 | 10.35 | 5 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5395.7513 | 27.8153 | 10.16 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5459.52 | -1.027 | 10.12 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5075.0654 | 331.3599 | 11.44 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.367 | 203] 1.5 [DL + RSY] | 5691.2022 | -92.415 | 17.8538 |
| Bottom | 1.399 | 203] 1.5 [DL + RSY] | 5754.9708 | 99.3717 | -18.6846 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4798.1751 | 189.1654 | -101.3842 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4861.9438 | 353.2904 | -102.0908 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5691.2022 | -0.8965 | 10.54 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5691.2022 | 17.8538 | 10.65 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5754.9708 | -2.4868 | 10.67 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5346.7551 | 353.2904 | 12.08 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.416 | 203] 1.5 [DL + RSY] | 5987.4022 | -89.222 | 13.7069 |
| Bottom | 1.453 | 203] 1.5 [DL + RSY] | 6051.1709 | 97.833 | -18.7196 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5050.5399 | 177.12 | -99.774 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5114.3086 | 382.1493 | -100.5167 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5987.4022 | -2.7547 | 11.1 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5987.4022 | 13.7069 | 11.17 | 5 |
| Bottom–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 5621.6373 | -404.0933 | 12.9 | 5 |
| Botttom–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 5621.6373 | 382.1493 | 12.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.478 | 203] 1.5 [DL + RSY] | 6284.2146 | -85.01 | -6.3902 |
| Bottom | 1.505 | 203] 1.5 [DL + RSY] | 6347.9833 | 94.8056 | -23.0177 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5305.7695 | 174.2305 | -98.4945 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5369.5381 | 418.4511 | -99.2227 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6284.2146 | -6.3902 | 11.68 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6284.2146 | 9.8282 | 11.7 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6347.9833 | -5.0157 | 11.79 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5899.8265 | 418.4511 | 13.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.54 | 203] 1.5 [DL + RSY] | 6580.6276 | -81.2315 | 5.085 |
| Bottom | 1.569 | 203] 1.5 [DL + RSY] | 6644.3963 | 96.3243 | -6.9402 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5563.9114 | 191.9065 | 97.2069 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5627.68 | 496.5706 | 97.8575 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6580.6276 | -14.052 | 12.27 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6580.6276 | 5.085 | 12.22 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6644.3963 | -6.9402 | 12.35 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6644.3963 | 12.6843 | 12.38 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.597 | 203] 1.5 [DL + RSY] | 6880.1519 | -70.2623 | -5.3701 |
| Bottom | 1.617 | 203] 1.5 [DL + RSY] | 6945.9449 | 77.1535 | -9.3645 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5828.711 | 262.2813 | -94.1252 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5894.5041 | 524.1411 | -94.6641 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6880.1519 | -5.3701 | 12.77 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6880.1519 | 15.8863 | 12.84 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6945.9449 | -9.3645 | 12.92 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6470.324 | 524.1411 | 15.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.053 | 203] 1.5 [DL + RSY] | 7132.9646 | -248.3353 | 53.6824 |
| Bottom | 2.185 | 202] 1.5 [DL + RSX] | 6730.4297 | 229.6522 | -944.6936 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6060.0663 | 395.1588 | -141.6616 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6145.0912 | 811.2822 | -142.0475 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6645.4048 | -318.9406 | 14.28 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7132.9646 | 53.6824 | 13.54 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7217.9895 | -48.7948 | 13.67 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6730.4297 | 811.2822 | 17.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P35 | 22595 | 30530 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 21695 | 30530 | 23495 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.018 | 203] 1.5 [DL + RSY] | 7426.3278 | -222.5709 | 63.8741 |
| Bottom | 2.119 | 202] 1.5 [DL + RSX] | 7015.8696 | 168.2359 | -1391.5248 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6337.9422 | 772.1949 | -176.086 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 6419.3231 | 1380.9034 | -176.1595 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 6934.4886 | -673.9183 | 17 | 5 |
| Top–Right | Leg 1 | 600 | 202] 1.5 [DL + RSX] | 7426.3278 | 63.8741 | 14.15 | 5 |
| Bottom–Left | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7015.8696 | -1391.5248 | 21.58 | 5 |
| Botttom–Right | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 7015.8696 | 1380.9034 | 21.52 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.093 | 202] 1.5 [DL + RSX] | 1549.038 | 82.335 | 242.2846 |
| Bottom | 0.864 | 202] 1.5 [DL + RSX] | 1591.5504 | -76.509 | -31.6379 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1435.6203 | 246.1327 | -87.1199 | 137.1527 | 396.9788 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1478.1327 | 41.4666 | -87.1252 | 138.4672 | 398.2933 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 1603.3307 | 246.1327 | 7.87 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1645.8432 | -47.2772 | 5.23 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1645.8432 | 41.4666 | 5.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.972 | 202] 1.5 [DL + RSX] | 1762.729 | 76.9901 | -123.9604 |
| Bottom | 0.934 | 202] 1.5 [DL + RSX] | 1805.2414 | -76.5043 | 65.2846 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1597.7895 | -6.3894 | 55.5824 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1640.3019 | 84.0506 | 55.8048 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1823.5057 | -6.3894 | 5.15 | 5 |
| Top–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 1139.2467 | 20.6105 | 3.45 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1866.0182 | -19.42 | 5.45 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 1866.0182 | 84.0506 | 6.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.019 | 202] 1.5 [DL + RSX] | 1986.4509 | 79.9091 | -97.95 |
| Bottom | 0.996 | 202] 1.5 [DL + RSX] | 2028.9633 | -78.227 | 70.1909 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1761.4435 | 30.4417 | 46.8955 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1803.956 | 92.5563 | 47.1962 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2045.094 | -101.6164 | 7.09 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2045.094 | 30.4417 | 6.1 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2087.6064 | -18.3422 | 6.05 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2087.6064 | 92.5563 | 7.08 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.082 | 202] 1.5 [DL + RSX] | 2213.0674 | 82.2033 | -97.2264 |
| Bottom | 1.063 | 202] 1.5 [DL + RSX] | 2255.5799 | -80.3512 | 71.4074 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1926.0177 | 36.6941 | 45.5845 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 1968.5301 | 94.4168 | 45.9587 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2267.6366 | -99.555 | 7.68 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2267.6366 | 36.6941 | 6.81 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2310.149 | -20.5802 | 6.7 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2310.149 | 94.4168 | 7.73 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.147 | 202] 1.5 [DL + RSX] | 2441.1721 | 84.223 | -99.7903 |
| Bottom | 1.137 | 202] 1.5 [DL + RSX] | 2483.6845 | -82.4297 | 73.2108 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2091.378 | 36.3823 | 45.2516 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 2133.8904 | 94.7876 | 45.6861 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2490.9376 | -99.6782 | 8.3 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2490.9376 | 36.3823 | 7.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2533.45 | -21.7259 | 7.34 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2533.45 | 94.7876 | 8.35 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.221 | 202] 1.5 [DL + RSX] | 2670.2171 | 86.0112 | -102.1238 |
| Bottom | 1.211 | 202] 1.5 [DL + RSX] | 2712.7296 | -84.3606 | 75.0313 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2301.8917 | 38.3399 | 45.4848 | 139.1434 | 398.9695 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2344.4042 | 75.0313 | 45.6822 | 139.1434 | 398.9695 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2714.7787 | -98.8889 | 8.91 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2714.7787 | 35.105 | 8.03 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2757.2912 | -22.7628 | 7.98 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2757.2912 | 94.978 | 8.98 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.209 | 202] 1.5 [DL + RSX] | 2899.8503 | 87.5819 | -103.6675 |
| Bottom | 1.2 | 202] 1.5 [DL + RSX] | 2942.3628 | -86.1165 | 76.6003 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2462.7844 | 39.6028 | 46.3513 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2505.2969 | 76.6003 | 46.5498 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2938.9453 | -97.2595 | 9.51 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2938.9453 | 33.1948 | 8.62 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2981.4578 | -24.3095 | 8.62 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 2981.4578 | 95.8519 | 9.61 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.274 | 202] 1.5 [DL + RSX] | 3129.7703 | 88.8974 | -103.6042 |
| Bottom | 1.267 | 202] 1.5 [DL + RSX] | 3172.2828 | -87.7023 | 78.6681 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2623.7161 | 39.7458 | 47.2261 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2666.2285 | 78.6681 | 47.4266 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3163.1891 | -94.8881 | 10.1 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3163.1891 | 31.0297 | 9.22 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3205.7015 | -26.2919 | 9.27 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3205.7015 | 97.6566 | 10.26 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.375 | 202] 1.5 [DL + RSX] | 3359.6621 | 89.8432 | -101.3153 |
| Bottom | 1.372 | 202] 1.5 [DL + RSX] | 3402.1746 | -88.9719 | 81.8043 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2784.5736 | 38.5673 | 47.7937 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2827.086 | 81.8043 | 47.9837 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3387.2085 | -92.1074 | 10.69 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3387.2085 | 29.3593 | 9.82 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3429.7209 | -29.3653 | 9.93 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3429.7209 | 99.2101 | 10.9 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.437 | 202] 1.5 [DL + RSX] | 3589.1871 | 90.4646 | -97.4356 |
| Bottom | 1.442 | 202] 1.5 [DL + RSX] | 3631.6996 | -90.3052 | 86.737 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2945.2251 | 34.8356 | 48.0947 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 2987.7375 | 86.737 | 48.2632 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3610.6312 | -90.503 | 11.29 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3610.6312 | 27.903 | 10.42 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3653.1436 | -34.1924 | 10.62 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3653.1436 | 99.2492 | 11.53 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.249 | 202] 1.5 [DL + RSX] | 3818.0399 | 90.0434 | -92.4884 |
| Bottom | 1.271 | 202] 1.5 [DL + RSX] | 3860.5524 | -88.3553 | 134.9401 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3105.7549 | 26.9835 | 61.2045 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3148.2674 | 134.9401 | 61.3519 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3833.2081 | -91.9901 | 11.93 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3833.2081 | 26.4852 | 11.02 | 5 |
| Bottom–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3875.7205 | -3.9768 | 10.82 | 5 |
| Botttom–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 3875.7205 | 142.9193 | 12.75 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P36 | 27340 | 29930 | 1200 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |
| Bottom | Leg 1 | 27340 | 29330 | 27340 | 30530 | 1200 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.308 | 202] 1.5 [DL + RSX] | 4046.9763 | 94.2667 | 58.7168 |
| Bottom | 1.475 | 202] 1.5 [DL + RSX] | 4089.4888 | -109.8745 | -314.9342 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3266.4076 | 58.7168 | -107.6078 | 144.5538 | 404.3799 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3308.9201 | -89.0921 | -107.7244 | 144.5538 | 404.3799 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4055.2252 | -52.3897 | 11.99 | 5 |
| Top–Right | Leg 1 | 300 | 203] 1.5 [DL + RSY] | 4055.2252 | 66.3054 | 12.19 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4097.7376 | -287.3756 | 15.37 | 5 |
| Botttom–Right | Leg 1 | 0 | 203] 1.5 [DL + RSY] | 0 | 0 | 0 | 0 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.809 | 202] 1.5 [DL + RSX] | 4296.7279 | 194.4229 | 936.4833 |
| Bottom | 1.466 | 202] 1.5 [DL + RSX] | 4360.4966 | -185.3172 | 185.2142 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3423.6282 | 936.4833 | -310.5912 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 3487.3969 | 185.2142 | -310.749 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4301.5279 | 940.9614 | 13.77 | 5 |
| Bottom–Left | Leg 1 | 450 | 202] 1.5 [DL + RSX] | 4360.4966 | -102.6744 | 8.71 | 5 |
| Botttom–Right | Leg 1 | 300 | 202] 1.5 [DL + RSX] | 4365.2966 | 252.0983 | 9.64 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.464 | 202] 1.5 [DL + RSX] | 4588.6864 | 182.7683 | -125.416 |
| Bottom | 1.496 | 202] 1.5 [DL + RSX] | 4652.4551 | -185.2842 | 164.812 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3577.1934 | 69.0137 | 80.2012 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3640.9621 | 246.6492 | 80.5769 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4622.1131 | -169.3243 | 9.6 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4622.1131 | 69.0137 | 8.99 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4685.8818 | -184.1016 | 9.81 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4685.8818 | 246.6492 | 10.2 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.497 | 202] 1.5 [DL + RSX] | 4878.0976 | 176.7318 | -140.8695 |
| Bottom | 1.533 | 202] 1.5 [DL + RSX] | 4941.8663 | -181.0593 | 177.8855 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3733.921 | 71.1999 | 91.174 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3797.6897 | 276.6586 | 91.7744 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4939.6602 | -185.3544 | 10.29 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 4939.6602 | 71.1999 | 9.59 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5003.4289 | -176.204 | 10.35 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5003.4289 | 276.6586 | 10.97 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.527 | 202] 1.5 [DL + RSX] | 5163.9348 | 172.4695 | -119.3879 |
| Bottom | 1.57 | 202] 1.5 [DL + RSX] | 5227.7035 | -177.2052 | 178.0739 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3889.6985 | 91.8693 | 83.9495 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 3953.4672 | 288.2316 | 84.7162 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5252.6996 | -163.167 | 10.73 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5252.6996 | 91.8693 | 10.29 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5316.4683 | -192.9176 | 11.04 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5316.4683 | 288.2316 | 11.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.555 | 202] 1.5 [DL + RSX] | 5446.1252 | 167.051 | -111.2289 |
| Bottom | 1.607 | 202] 1.5 [DL + RSX] | 5509.8939 | -172.8816 | 187.4565 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4045.7758 | 89.3385 | 83.0983 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4109.5445 | 305.2066 | 83.9611 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5560.9492 | -160.4319 | 11.29 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5560.9492 | 89.3385 | 10.85 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5624.7179 | -211.7676 | 11.72 | 5 |
| Botttom–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5624.7179 | 305.2066 | 12.3 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.576 | 202] 1.5 [DL + RSX] | 5724.2013 | 160.1869 | -95.7055 |
| Bottom | 1.643 | 202] 1.5 [DL + RSX] | 5787.97 | -167.5183 | 207.0687 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4203.0966 | 93.7425 | 81.6124 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4266.8653 | 328.3448 | 82.4928 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5863.5632 | -161.4575 | 11.86 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5863.5632 | 93.7425 | 11.44 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 5927.3318 | -233.0241 | 12.41 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 5927.3318 | 328.3448 | 13 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.595 | 202] 1.5 [DL + RSX] | 5997.3958 | 151.7209 | -76.4275 |
| Bottom | 1.677 | 202] 1.5 [DL + RSX] | 6061.1644 | -161.0862 | 238.0661 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4524.5644 | 16.196 | 79.6463 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 4426.4263 | 358.327 | 80.3985 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6159.3026 | -171.7689 | 12.47 | 5 |
| Top–Right | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6159.3026 | 111.5374 | 12.09 | 5 |
| Bottom–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6223.0713 | -260.4902 | 13.13 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6223.0713 | 358.327 | 13.74 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.619 | 202] 1.5 [DL + RSX] | 6264.7117 | 140.7282 | -76.2766 |
| Bottom | 1.704 | 202] 1.5 [DL + RSX] | 6328.4804 | -151.7173 | 276.6414 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4707.5606 | 24.7645 | 78.3822 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4771.3292 | 276.6414 | 78.4954 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 450 | 203] 1.5 [DL + RSY] | 6446.5692 | -197.4186 | 13.16 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6446.5692 | 145.9065 | 12.84 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6510.3379 | -302.7961 | 13.93 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6510.3379 | 391.5238 | 14.47 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 1.65 | 202] 1.5 [DL + RSX] | 6525.3942 | 129.5281 | -119.7173 |
| Bottom | 1.771 | 202] 1.5 [DL + RSX] | 6591.1873 | -154.5737 | 317.3445 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4892.1878 | 65.1602 | 72.9664 | 210.3948 | 600.1339 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 4957.9809 | 317.3445 | 73.0498 | 210.3948 | 600.1339 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6724.8036 | -245.1091 | 13.97 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6724.8036 | 190.552 | 13.63 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6790.5967 | -370.6904 | 14.86 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6790.5967 | 412.0796 | 15.12 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.074 | 202] 1.5 [DL + RSX] | 6783.0279 | 261.6605 | -190.5235 |
| Bottom | 2.185 | 202] 1.5 [DL + RSX] | 6868.0528 | 264.1603 | -478.3261 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5086.1939 | 154.0559 | -63.715 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5171.2188 | 442.4323 | -63.7691 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6996.7221 | -300.3359 | 14.81 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 6996.7221 | 263.8683 | 14.59 | 5 |
| Bottom–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7081.747 | -514.107 | 16.29 | 5 |
| Botttom–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7081.747 | 478.2132 | 16.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P36 | 27340 | 29630 | 1800 | 300 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |
| Bottom | Leg 1 | 27340 | 28730 | 27340 | 30530 | 1800 | 300 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 2.025 | 202] 1.5 [DL + RSX] | 7003.2661 | 220.9166 | -392.1689 |
| Bottom | 2.122 | 202] 1.5 [DL + RSX] | 7084.6471 | 223.1086 | 712.57 |

Design Inadequacy Message: Pier fails in flexure or P-M-M interaction !!

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5268.7942 | 359.6702 | 85.5941 | 231.8037 | 621.5428 |
| Bottom | Leg 1 | 750 | 202] 1.5 [DL + RSX] | 5350.1751 | 712.57 | 85.6029 | 231.8037 | 621.5428 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7226.1315 | -445.1782 | 16.13 | 5 |
| Top–Right | Leg 1 | 600 | 203] 1.5 [DL + RSY] | 7226.1315 | 412.6795 | 15.93 | 5 |
| Bottom–Left | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7307.5125 | -603.6667 | 17.26 | 5 |
| Botttom–Right | Leg 1 | 750 | 203] 1.5 [DL + RSY] | 7307.5125 | 717.342 | 17.96 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 2929 | 0.0061 | 0.0023 | 203] 1.5 [DL + RSY] | 94.5264 | -94.8203 | -58.3506 | 480000 |
| Bottom | 2760 | 0.0057 | 0.0023 | 203] 1.5 [DL + RSY] | 173.1632 | 93.5604 | 134.5624 | 480000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 87.6033 | 136.7597 | 137.5037 | 155.8708 | 502.3056 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 166.2401 | 454.8431 | 143.0752 | 154.7442 | 501.179 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 450.3193 | -119.7784 | 1.56 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 450.3193 | 162.5154 | 1.78 | 6 |
| Bottom–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 513.2287 | -195.4573 | 2.09 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 513.2287 | 368.2748 | 2.99 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P37 | 11720 | 17790 | 2400 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 1 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area ($mm^2$) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ $mm^2$ |
|---|---|---|---|---|---|---|---|---|
| Top | 2443 | 0.0051 | 0.0023 | 207] [0.9 DL + 1.5 RSY] | 196.7416 | -87.0253 | -157.4887 | 480000 |
| Bottom | 1909 | 0.004 | 0.0023 | 207] [0.9 DL + 1.5 RSY] | 228.5922 | -72.9977 | 77.4108 | 480000 |

**Shear Design**

| Station Location | ID | Rebar $mm^2/m$ | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 478.9096 | 50.5933 | 285.1149 | 157.2281 | 503.6629 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 531.9939 | 828.5229 | 287.3827 | 140.3703 | 486.8051 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1056.4127 | -10.4257 | 2.26 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 963.7811 | 50.5933 | 2.27 | 6 |
| Bottom–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1098.8802 | -530.9907 | 5.05 | 6 |
| Botttom–Right | Leg 1 | 200 | 204] 1.2 [DL + LL + RSX] | 1016.8654 | 828.5229 | 6.43 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR+OHT(+89.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.128 | 203] 1.5 [DL + RSY] | 1524.9038 | 5806.6612 | 1840.8937 |
| Bottom | 0.092 | 202] 1.5 [DL + RSX] | 2718.3107 | 2781.3959 | 5519.3038 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -35.7045 | 35.4595 | 33.8341 | 18.5143 | 76.2534 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 484.9782 | 621.3722 | 175.4126 | 177.7425 | 524.1773 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 54.3073 | 275.8638 | -385.128 | 279.5666 | 885.8275 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 56.2424 | 40.099 | -29.6347 | 48 | 163.4783 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 42.703 | 6.4166 | 280.2593 | 140.3995 | 443.53 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -236.5573 | -20.7562 | 142.5014 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -122.9857 | 7.6066 | -223.4913 | 18.5143 | 76.2534 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | -12.7592 | -1.7377 | 32.6785 | 48 | 163.4783 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 53.1216 | 303.8506 | -456.4948 | 279.5196 | 885.7805 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 269.6057 | 135.3064 | 428.8821 | 149.3918 | 452.5223 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 382.9648 | 75.3538 | 53.8966 | 18.5143 | 76.2534 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 47.4821 | 71.804 | -213.8769 | 140.5889 | 443.7194 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 444.0513 | -947.11 | 99.6799 | 182.7256 | 543.5952 |
| Top | Leg 14 | OS | 205] 1.2 [DL + LL + RSY] | -456.1283 | -13.4223 | 618.31 | 18.5143 | 76.2534 |
| Top | Leg 15 | 502.55 | 202] 1.5 [DL + RSX] | 19.2926 | 76.0407 | 444.1456 | 139.4718 | 444.1456 |
| Bottom | Leg 1 | 500 | 203] 1.5 [DL + RSY] | -51.9951 | -11.6315 | 18.9245 | 18.5143 | 76.2534 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 240.7997 | 145.765 | 125.1562 | 168.0655 | 514.5003 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 372.4039 | 548.8376 | -353.1507 | 292.173 | 898.4338 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | -1.411 | 14.1325 | -29.631 | 48 | 163.4783 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 6.4772 | 80.7481 | -239.3769 | 138.9639 | 442.0943 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -350.9911 | 510.292 | 149.1884 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -6.2175 | -5.9752 | -228.7619 | 18.5143 | 76.2534 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | -1.9782 | 26.8046 | 27.1592 | 48 | 163.4783 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 358.823 | 465.3211 | -421.4725 | 291.6348 | 897.8956 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 278.5594 | 145.9219 | -196.0372 | 149.7467 | 452.8771 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -36.2137 | -5.7596 | 16.0543 | 18.5143 | 76.2534 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | -11.4068 | 65.8191 | 233.6007 | 138.7072 | 441.8376 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -311.6376 | 535.7492 | 171.5331 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | 1486.36 | 202] 1.5 [DL + RSX] | 205.6189 | -37.3063 | 190.1566 | 18.5143 | 190.1566 |
| Bottom | Leg 15 | 517.56 | 206] [0.9 DL + 1.5 RSX] | 141.3303 | 69.453 | -458.0875 | 144.3082 | 458.0875 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 334.1515 | -0.9865 | 4.36 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 334.1515 | 35.4595 | 10.83 | 5 |
| Top–Left | Leg 2 | 0 | 205] 1.2 [DL + LL + RSY] | 1112.9881 | -15.2497 | 2.4 | 5 |
| Top–Right | Leg 2 | 200 | 205] 1.2 [DL + LL + RSY] | 859.245 | 621.3722 | 5.03 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 206] [0.9 DL + 1.5 RSX] | 103.353 | -46.6628 | 0.2 | 5 |
| Top–Right | Leg 3 | 0 | 206] [0.9 DL + 1.5 RSX] | 203.782 | 282.0556 | 0.72 | 5 |
| Top–Left | Leg 4 | 0 | 204] 1.2 [DL + LL + RSX] | 93.8842 | -10.8974 | 1.1 | 5 |
| Top–Right | Leg 4 | 0 | 204] 1.2 [DL + LL + RSX] | 145.4498 | 13.8619 | 1.56 | 5 |
| Top–Left | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 88.5748 | -57.255 | 0.6 | 5 |
| Top–Right | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 88.5748 | 0.3404 | 0.21 | 5 |
| Top–Left | Leg 6 | 0 | 204] 1.2 [DL + LL + RSX] | 298.5248 | -69.0514 | 0.93 | 5 |
| Top–Right | Leg 6 | 0 | 204] 1.2 [DL + LL + RSX] | 265.2095 | 90.0093 | 0.96 | 5 |
| Top–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 29.6757 | -2.171 | 0.78 | 5 |
| Top–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 29.6757 | 7.4774 | 1.77 | 5 |
| Top–Left | Leg 8 | 0 | 205] 1.2 [DL + LL + RSY] | 80.1044 | -18.8269 | 1.38 | 5 |
| Top–Right | Leg 8 | 0 | 205] 1.2 [DL + LL + RSY] | 6.6299 | 9.4561 | 0.48 | 5 |
| Top–Left | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 9 | 0 | 202] 1.5 [DL + RSX] | 203.1902 | 306.9505 | 0.76 | 5 |
| Top–Left | Leg 10 | 200 | 204] 1.2 [DL + LL + RSX] | 757.744 | -572.6806 | 5.7 | 5 |
| Top–Right | Leg 10 | 0 | 204] 1.2 [DL + LL + RSX] | 757.744 | 83.6698 | 2.37 | 5 |
| Top–Left | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 645.295 | 75.3538 | 22.2 | 5 |
| Top–Left | Leg 12 | 0 | 206] [0.9 DL + 1.5 RSX] | 37.973 | -12.2638 | 0.17 | 5 |
| Top–Right | Leg 12 | 0 | 206] [0.9 DL + 1.5 RSX] | 90.8307 | 61.6503 | 0.64 | 5 |
| Top–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 718.0155 | -1297.5632 | 7.66 | 5 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 44.7396 | -3.7953 | 0.13 | 5 |
| Top–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 42.3534 | 58.8996 | 0.5 | 5 |
| Bottom–Left | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 73.5686 | -25.2788 | 5.66 | 5 |
| Botttom–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 73.5686 | 5.2358 | 1.9 | 5 |
| Bottom–Left | Leg 2 | 0 | 204] 1.2 [DL + LL + RSX] | 896.5777 | -119.6852 | 2.49 | 5 |
| Botttom–Right | Leg 2 | 0 | 204] 1.2 [DL + LL + RSX] | 896.5777 | 122.5726 | 2.51 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 541.2608 | -76.72 | 0.77 | 5 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 610.6716 | 513.4155 | 1.6 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 78.173 | -10.1653 | 0.97 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 44.0927 | 9.9893 | 0.74 | 5 |
| Bottom–Left | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 327.9892 | -58.2942 | 1.18 | 5 |
| Botttom–Right | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 327.9892 | 66.2726 | 1.23 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 181.3813 | -30.8484 | 0.51 | 5 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 181.3813 | 390.4311 | 2.24 | 5 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 162.1349 | -6.594 | 3.26 | 5 |
| Botttom–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 162.1349 | 1.4239 | 2.29 | 5 |
| Bottom–Left | Leg 8 | 0 | 205] 1.2 [DL + LL + RSY] | 66.6804 | -2.9025 | 0.55 | 5 |
| Botttom–Right | Leg 8 | 0 | 205] 1.2 [DL + LL + RSY] | 66.6804 | 4.2636 | 0.62 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 525.3252 | -61.7232 | 0.73 | 5 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 589.8944 | 276.7555 | 1.17 | 5 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 897.0104 | -63.7976 | 2.57 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 897.0104 | 145.9219 | 3.13 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 137.3974 | -35.5094 | 8.38 | 5 |
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 117.1606 | 2.4942 | 1.93 | 5 |
| Bottom–Left | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 311.0716 | -67.4592 | 1.2 | 5 |
| Botttom–Right | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 311.0716 | 52.6696 | 1.1 | 5 |
| Bottom–Left | Leg 13 | 0 | 206] [0.9 DL + 1.5 RSX] | 186.2154 | -19.546 | 0.47 | 5 |
| Botttom–Right | Leg 13 | 0 | 206] [0.9 DL + 1.5 RSX] | 186.2154 | 406.6984 | 2.32 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 360.5776 | -37.3063 | 11.5 | 5 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Bottom–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 351.2094 | -1.4734 | 0.85 | 5 |
| Botttom–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 351.2094 | 1.0832 | 0.84 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| TF(+86.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.107 | 203] 1.5 [DL + RSY] | 4526.2943 | 5580.3712 | 1100.5008 |
| Bottom | 0.113 | 202] 1.5 [DL + RSX] | 4495.9457 | 2094.7476 | 8201.787 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 7.5114 | 29.7415 | 31.3773 | 18.6667 | 76.4058 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 145.8964 | 119.9784 | -93.3575 | 164.3045 | 510.7392 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 377.2907 | 543.8748 | -337.075 | 292.3666 | 898.6275 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 21.6411 | 20.6336 | -17.7405 | 48.8348 | 164.313 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 10.8139 | 49.2474 | 220.9018 | 139.1358 | 442.2662 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -98.2493 | 11.8381 | 172.2258 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -106.7704 | -2.8861 | -234.996 | 18.6667 | 76.4058 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 36.9163 | 26.9154 | -21.0085 | 48.8348 | 164.313 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 369.5497 | 551.9604 | -382.6043 | 292.0599 | 898.3207 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 228.1734 | 51.9459 | -86.2272 | 147.7498 | 450.8803 |
| Top | Leg 11 | 500 | 203] 1.5 [DL + RSY] | 183.2519 | 19.1534 | 32.0649 | 18.6667 | 76.4058 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1.2537 | 48.6077 | -227.168 | 138.7569 | 441.8873 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -136.7209 | 131.9611 | 195.1552 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 205] 1.2 [DL + LL + RSY] | 97.3963 | -12.1207 | 226.6425 | 18.6667 | 76.4058 |
| Top | Leg 15 | 518.55 | 206] [0.9 DL + 1.5 RSX] | 150.95 | 45.3886 | -459.0635 | 144.6894 | 459.0635 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -120.971 | -0.0596 | 27.6628 | 18.6667 | 76.4058 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 231.4714 | 128.5091 | -99.2868 | 167.6959 | 514.1306 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 588.7606 | 645.9877 | -314.954 | 300.7473 | 907.0082 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 24.1831 | 15.3329 | -17.5284 | 48.8348 | 164.313 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 51.5569 | 97.4107 | 246.3491 | 140.7504 | 443.8809 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -374.5714 | 497.1181 | 165.7144 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | 37.4678 | 0.5698 | -219.9178 | 18.6667 | 76.4058 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 45.8435 | 18.0692 | -18.5051 | 48.8348 | 164.313 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 616.4017 | 576.672 | -352.9602 | 301.8428 | 908.1036 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 220.7632 | 146.2597 | -102.6147 | 147.4562 | 450.5866 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -89.165 | -0.2693 | 29.3726 | 18.6667 | 76.4058 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 69.4507 | 81.6127 | -241.0225 | 141.4596 | 444.59 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -186.041 | 378.7939 | 188.7509 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 13.0654 | 6.6682 | 236.7647 | 18.6667 | 76.4058 |
| Bottom | Leg 15 | 527.44 | 206] [0.9 DL + 1.5 RSX] | 232.2678 | 94.6543 | -467.6758 | 147.9121 | 467.6758 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 316.8468 | -5.3404 | 4.96 | 5 |
| Top–Right | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 397.9363 | 29.7415 | 10.55 | 5 |
| Top–Left | Leg 2 | 0 | 204] 1.2 [DL + LL + RSX] | 793.0073 | -17.5551 | 1.74 | 5 |
| Top–Right | Leg 2 | 0 | 204] 1.2 [DL + LL + RSX] | 854.9376 | 104.3444 | 2.32 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 207] [0.9 DL + 1.5 RSY] | 359.3226 | -97.3269 | 0.59 | 5 |
| Top–Right | Leg 3 | 0 | 207] [0.9 DL + 1.5 RSY] | 619.375 | 371.6898 | 1.37 | 5 |
| Top–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 140.9175 | -0.5653 | 0.91 | 5 |
| Top–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 140.9175 | 2.3102 | 0.99 | 5 |
| Top–Left | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 350.1868 | -44.7953 | 1.14 | 5 |
| Top–Right | Leg 5 | 0 | 204] 1.2 [DL + LL + RSX] | 350.1868 | 38.4476 | 1.1 | 5 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 765.7296 | -366.3987 | 3.29 | 5 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 765.7296 | 11.8381 | 1.59 | 5 |
| Top–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 4.9297 | -6.0705 | 1.2 | 5 |
| Top–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 4.9297 | 4.3969 | 0.89 | 5 |
| Top–Left | Leg 8 | 0 | 204] 1.2 [DL + LL + RSX] | 103.342 | -9.1942 | 1.08 | 5 |
| Top–Right | Leg 8 | 0 | 204] 1.2 [DL + LL + RSX] | 145.2355 | 8.7259 | 1.32 | 5 |
| Top–Left | Leg 9 | 0 | 207] [0.9 DL + 1.5 RSY] | 381.4885 | -82.314 | 0.59 | 5 |
| Top–Right | Leg 9 | 0 | 207] [0.9 DL + 1.5 RSY] | 638.0553 | 383.9697 | 1.41 | 5 |
| Top–Left | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 845.3349 | -18.7306 | 2.14 | 5 |
| Top–Right | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 845.3349 | 51.9459 | 2.37 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 443.0996 | -0.0522 | 5.55 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 443.0996 | 29.2248 | 11.02 | 5 |
| Top–Left | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 339.9113 | -35.9491 | 1.05 | 5 |
| Top–Right | Leg 12 | 0 | 204] 1.2 [DL + LL + RSX] | 339.9113 | 41.2913 | 1.09 | 5 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 688.6768 | -254.8414 | 2.6 | 5 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 688.6768 | 131.9611 | 2.01 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 227.0337 | -21.5746 | 6.88 | 5 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 0 | 0 | 0 | 0 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 305.3284 | -33.8962 | 0.96 | 5 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 362.3871 | 1.7586 | 0.87 | 5 |
| Bottom–Left | Leg 1 | 200 | 206] [0.9 DL + 1.5 RSX] | 89.1245 | -23.122 | 5.45 | 5 |
| Botttom–Right | Leg 1 | 0 | 206] [0.9 DL + 1.5 RSX] | 89.1245 | 5.7358 | 2.19 | 5 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 996.5356 | -189.9557 | 3.07 | 5 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 996.5356 | 128.5091 | 2.75 | 5 |
| Bottom–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 859.1112 | -130.846 | 1.25 | 5 |
| Botttom–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 943.5763 | 298.7019 | 1.63 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 170.4921 | -2.2147 | 1.17 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 100.5959 | 15.3329 | 1.35 | 5 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 594.9332 | -77.7828 | 1.95 | 5 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 594.9332 | 97.4107 | 2.08 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 509.2558 | -37.6604 | 1.2 | 5 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 542.9269 | 497.1181 | 3.47 | 5 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 237.1396 | -2.4933 | 3.43 | 5 |
| Botttom–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 237.1396 | 7.6752 | 4.4 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 182.2798 | -2.5143 | 1.26 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 182.2798 | 0.676 | 1.17 | 5 |
| Bottom–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 884.7038 | -134.6094 | 1.28 | 5 |
| Botttom–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 968.6245 | 261.6449 | 1.6 | 5 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 971.5387 | -77.871 | 2.84 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 971.5387 | 146.2597 | 3.31 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 115.9725 | -28.908 | 6.87 | 5 |
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 110.611 | 5.5662 | 2.43 | 5 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 607.8474 | -93.8989 | 2.09 | 5 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 607.8474 | 81.6127 | 2 | 5 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 728.6577 | -54.0672 | 1.72 | 5 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 728.6577 | 378.7939 | 3.28 | 5 |
| Bottom–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 228.1632 | -1.4458 | 3.12 | 5 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 228.1632 | 8.7117 | 4.49 | 5 |
| Bottom–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 531.2457 | -1.8844 | 1.28 | 5 |
| Botttom–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 531.2457 | 1.3016 | 1.27 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 26F(+83.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.125 | 203] 1.5 [DL + RSY] | 6191.2909 | 6113.8496 | 821.4935 |
| Bottom | 0.139 | 202] 1.5 [DL + RSX] | 6016.3944 | 1687.7048 | 10577.693 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 10.9912 | 30.3876 | 29.1885 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 214.5884 | 157.5689 | -113.8238 | 167.0268 | 513.4616 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 592.3563 | 628.2756 | -290.0458 | 300.8898 | 907.1507 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 53.5972 | 24.5276 | -20.3927 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 54.1845 | 63.8412 | 251.8821 | 140.8546 | 443.985 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -121.8444 | 31.4107 | 170.2362 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -68.4439 | -2.3504 | -220.0104 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 69.5412 | 15.6428 | 17.7158 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 621.5522 | 632.5203 | -307.7651 | 302.0469 | 908.3077 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 182.1323 | 26.3808 | 77.8769 | 145.9252 | 449.0556 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 20.19 | 30.2693 | 29.5762 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 74.5518 | 66.9637 | -247.4854 | 141.6617 | 444.7922 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -28.1992 | 26.1913 | 170.271 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -75.1352 | 6.7848 | 222.8907 | 18.5891 | 76.3282 |
| Top | Leg 15 | 531.92 | 206] [0.9 DL + 1.5 RSX] | 238.8157 | 44.964 | -470.6529 | 148.1716 | 470.6529 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -128.6969 | 0.7679 | 28.4599 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 267.4102 | 139.1555 | -120.4278 | 169.1201 | 515.5549 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 792.8222 | 730.778 | -272.317 | 308.8344 | 915.0953 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 57.5042 | 14.6849 | -19.402 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 87.429 | 106.8529 | 256.1381 | 142.1721 | 445.3025 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -377.5538 | 462.0408 | 166.9925 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | 50.9162 | 3.4826 | -211.8782 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 75.0654 | 20.6822 | 17.1708 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 825.5466 | 681.9977 | -281.4561 | 310.1313 | 916.3922 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 210.424 | 151.5873 | 94.7956 | 147.0464 | 450.1769 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -109.2621 | 0.2252 | 28.2543 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 111.3765 | 93.3141 | -255.0311 | 143.1211 | 446.2515 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -257.5684 | 403.2073 | 164.9029 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 23.4909 | 2.6647 | 223.2034 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 585.64 | 206] [0.9 DL + 1.5 RSX] | 303.4406 | 113.0294 | -505.784 | 150.7327 | 505.784 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 398.8611 | -0.1399 | 5.01 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 398.8611 | 30.3876 | 10.68 | 5 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 918.5565 | -51.8386 | 2.18 | 5 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 985.6613 | 102.7975 | 2.59 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 860.4429 | -58.9488 | 1.12 | 5 |
| Top–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 951.5926 | 334.7788 | 1.7 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 145.6281 | -12.5859 | 1.5 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 234.599 | 7.0125 | 1.79 | 5 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 609.2675 | -64.9089 | 1.89 | 5 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 609.2675 | 63.8412 | 1.88 | 5 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1088.9252 | -355.0675 | 3.88 | 5 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1088.9252 | 31.4107 | 2.33 | 5 |
| Top–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 59.4225 | -4.9334 | 1.67 | 5 |
| Top–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 59.4225 | 5.591 | 1.79 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 241.4719 | -1.4184 | 1.58 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 163.608 | 15.6428 | 1.76 | 5 |
| Top–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 916.4663 | -57.4211 | 1.19 | 5 |
| Top–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1005.3104 | 357.839 | 1.81 | 5 |
| Top–Left | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 928.8884 | -46.2238 | 2.53 | 5 |
| Top–Right | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 928.8884 | 26.3808 | 2.39 | 5 |
| Top–Left | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 322.0289 | -5.9743 | 5.15 | 5 |
| Top–Right | Leg 11 | 200 | 206] [0.9 DL + 1.5 RSX] | 407.5836 | 30.2693 | 10.77 | 5 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 625.5605 | -59.4488 | 1.89 | 5 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 625.5605 | 66.9637 | 1.94 | 5 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1156.3758 | -360.0693 | 4.04 | 5 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1156.3758 | 26.1913 | 2.44 | 5 |
| Top–Left | Leg 14 | 0 | 206] [0.9 DL + 1.5 RSX] | 83.7356 | -3.7672 | 1.75 | 5 |
| Top–Right | Leg 14 | 0 | 206] [0.9 DL + 1.5 RSX] | 83.7356 | 6.9164 | 2.34 | 5 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 447.7167 | -30.4149 | 1.27 | 5 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 534.0481 | 3.9788 | 1.3 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 134.9748 | -29.4193 | 7.2 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 134.9748 | 0.7679 | 1.83 | 5 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1150.6068 | -210.314 | 3.49 | 5 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1150.6068 | 139.1555 | 3.12 | 5 |
| Bottom–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1105.216 | -262.1494 | 1.76 | 5 |
| Botttom–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1261.6234 | 256.3456 | 1.94 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 268.1976 | -3.2635 | 1.83 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 177.1762 | 14.6849 | 1.8 | 5 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 815.6699 | -89.711 | 2.55 | 5 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 815.6699 | 106.8529 | 2.67 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 822.2028 | -50.466 | 1.89 | 5 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 933.3651 | 462.0408 | 4.08 | 5 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 283.8518 | -4.0856 | 4.31 | 5 |
| Botttom–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 283.8518 | 6.6885 | 4.8 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 278.6109 | -0.2172 | 1.75 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 278.6109 | 3.0161 | 1.88 | 5 |
| Bottom–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1136.4031 | -271.7993 | 1.82 | 5 |
| Botttom–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1296.0736 | 209.1601 | 1.9 | 5 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1080.799 | -92.7383 | 3.2 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1080.799 | 151.5873 | 3.6 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 156.4873 | -29.4461 | 7.48 | 5 |
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 156.4873 | 0.2252 | 2 | 5 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 841.3857 | -102.4315 | 2.7 | 5 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 841.3857 | 93.3141 | 2.64 | 5 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1055.9384 | -15.8747 | 2.19 | 5 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1055.9384 | 403.2073 | 4.05 | 5 |
| Bottom–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 282.7218 | -7.1119 | 4.87 | 5 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 282.7218 | 4.0182 | 4.29 | 5 |
| Bottom–Left | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 659.9851 | -2.2358 | 1.59 | 5 |
| Botttom–Right | Leg 15 | 0 | 205] 1.2 [DL + LL + RSY] | 659.9851 | 1.8276 | 1.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 25F(+80.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.148 | 202] 1.5 [DL + RSX] | 6875.0882 | 1486.8396 | 11045.4093 |
| Bottom | 0.168 | 202] 1.5 [DL + RSX] | 7522.2221 | 1457.1437 | 12816.7348 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 14.076 | 30.2238 | 31.7802 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 243.9066 | 177.0016 | -120.0956 | 168.1887 | 514.6235 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 794.8505 | 712.0972 | -253.6966 | 308.9148 | 915.1757 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 87.4749 | 26.2011 | -21.473 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 90.16 | 74.6981 | 276.0512 | 142.2803 | 445.4107 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -108.9686 | 40.4915 | 187.0256 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -53.6209 | 2.4075 | -212.4213 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 101.3707 | 21.0697 | 18.6679 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 827.7891 | 723.5646 | -255.3913 | 310.2202 | 916.481 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 179.0609 | 17.5863 | 99.1618 | 145.8035 | 448.9339 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 16.1655 | 29.8546 | 32.4756 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 115.2078 | 84.2147 | -277.706 | 143.2729 | 446.4034 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -74.178 | 80.2991 | 178.3747 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -66.808 | 5.6838 | 224.6927 | 18.5891 | 76.3282 |
| Top | Leg 15 | 593.81 | 206] [0.9 DL + 1.5 RSX] | 308.9385 | 59.853 | -510.9552 | 150.9506 | 510.9552 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -141.0514 | 1.8287 | 30.2307 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 316.143 | 152.2348 | -119.519 | 171.0514 | 517.4862 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 993.874 | 822.6731 | -245.952 | 316.8022 | 923.0631 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 85.8394 | 16.961 | -20.3414 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 130.4309 | 117.4418 | 284.1911 | 143.8762 | 447.0067 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -380.2056 | 445.0286 | 185.206 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | 64.4168 | 3.7189 | -204.5244 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 99.8589 | 21.476 | -18.3154 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1019.3955 | 784.8751 | -243.9178 | 317.8137 | 924.0745 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 229.6027 | 158.2839 | 102.3388 | 147.8065 | 450.9369 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -128.6396 | 1.393 | 30.1654 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 142.7913 | 104.059 | -287.1099 | 144.3661 | 447.4965 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -301.481 | 393.7516 | 175.2767 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 24.989 | 3.5511 | 221.3443 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 653.41 | 206] [0.9 DL + 1.5 RSX] | 370.8162 | 128.3045 | -549.5369 | 153.4029 | 549.5369 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 431.5382 | -1.0568 | 5.59 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 431.5382 | 30.2238 | 11.06 | 5 |
| Top–Left | Leg 2 | 0 | 203] 1.5 [DL + RSY] | 1156.3059 | -0.2077 | 2.41 | 5 |
| Top–Right | Leg 2 | 0 | 203] 1.5 [DL + RSY] | 1156.3059 | 101.4637 | 2.94 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1105.7638 | -200.2981 | 1.66 | 5 |
| Top–Right | Leg 3 | 0 | 205] 1.2 [DL + LL + RSY] | 1267.0047 | 280.0638 | 1.98 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 220.6548 | -17.2714 | 2.19 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 327.3634 | 5.6135 | 2.31 | 5 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 828.3454 | -79.2369 | 2.51 | 5 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 828.3454 | 74.6981 | 2.48 | 5 |
| Top–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1420.8358 | -377.7051 | 4.65 | 5 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1420.8358 | 40.4915 | 3.04 | 5 |
| Top–Left | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 108.8568 | -6.3306 | 2.55 | 5 |
| Top–Right | Leg 7 | 0 | 206] [0.9 DL + 1.5 RSX] | 108.8568 | 6.1878 | 2.52 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 334.7427 | -2.1487 | 2.19 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 334.7427 | 0.8641 | 2.13 | 5 |
| Top–Left | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1165.1305 | -204.7045 | 1.74 | 5 |
| Top–Right | Leg 9 | 0 | 205] 1.2 [DL + LL + RSY] | 1334.7415 | 311.4806 | 2.12 | 5 |
| Top–Left | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 1042.6391 | -61.8942 | 2.9 | 5 |
| Top–Right | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 1042.6391 | 17.5863 | 2.6 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 431.5616 | -0.9287 | 5.57 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 431.5616 | 29.8546 | 10.99 | 5 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 856.1639 | -69.7554 | 2.51 | 5 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 856.1639 | 84.2147 | 2.61 | 5 |
| Top–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1444.9945 | -342.9806 | 4.54 | 5 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1444.9945 | 80.2991 | 3.28 | 5 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 143.5539 | -5.8224 | 2.89 | 5 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 143.5539 | 6.7435 | 3.06 | 5 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 557.7682 | -40.9743 | 1.61 | 5 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 660.5353 | 4.9706 | 1.61 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 195.0623 | -29.3358 | 7.94 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 195.0623 | 1.8287 | 2.78 | 5 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1328.0862 | -223.6693 | 3.93 | 5 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1328.0862 | 152.2348 | 3.56 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1354.8977 | -521.2491 | 2.5 | 5 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1585.6168 | 232.9733 | 2.28 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 359.9198 | -2.4699 | 2.37 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 249.4606 | 16.961 | 2.35 | 5 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1024.2192 | -103.4057 | 3.14 | 5 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1024.2192 | 117.4418 | 3.24 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1106.3596 | -55.9801 | 2.48 | 5 |
| Botttom–Right | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1287.8981 | 445.0286 | 4.71 | 5 |
| Bottom–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 329.0689 | -4.5025 | 4.96 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 329.0689 | 7.6326 | 5.54 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 368.7824 | -1.111 | 2.36 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 368.7824 | 2.4505 | 2.42 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1378.5195 | -538.4933 | 2.56 | 5 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1612.5605 | 177.7362 | 2.22 | 5 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1225.6642 | -102.2154 | 3.61 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1225.6642 | 158.2839 | 4 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 209.9056 | -29.1798 | 8.1 | 5 |
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 209.9056 | 1.393 | 2.89 | 5 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1043.7828 | -116.8127 | 3.28 | 5 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1043.7828 | 104.059 | 3.19 | 5 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1376.0129 | -22.314 | 2.86 | 5 |
| Botttom–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1376.0129 | 393.7516 | 4.64 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 320.7625 | -7.3097 | 5.38 | 5 |
| Botttom–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 320.7625 | 5.0903 | 4.96 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 786.3965 | -4.3516 | 1.9 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 786.3965 | 1.4318 | 1.88 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 24F(+77) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.175 | 202] 1.5 [DL + RSX] | 8362.6605 | 1295.3496 | 13007.209 |
| Bottom | 0.196 | 202] 1.5 [DL + RSX] | 9009.7944 | 1328.3053 | 15010.0704 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 22.4351 | 29.8653 | 35.2905 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 282.9487 | 201.4934 | -135.1582 | 169.7359 | 516.1707 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 995.2157 | 804.5782 | -232.1275 | 316.8554 | 923.1163 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 117.7263 | 28.8334 | -23.5323 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 133.5442 | 81.9903 | 305.5217 | 143.9996 | 447.1301 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -94.4551 | 66.0839 | 201.3723 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -39.539 | 2.5825 | -207.014 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 128.1253 | 22.9674 | 21.2491 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1020.7808 | 819.6827 | -229.7292 | 317.8686 | 924.1294 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 210.8208 | 14.2515 | 107.0265 | 147.0621 | 450.1926 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 20.0055 | 29.4832 | 35.8718 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 146.2463 | 93.2768 | -308.6926 | 144.503 | 447.6335 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -90.6996 | 98.4647 | 192.5233 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -68.142 | 6.3153 | 223.3381 | 18.5891 | 76.3282 |
| Top | Leg 15 | 658.52 | 206] [0.9 DL + 1.5 RSX] | 376.0754 | 72.2516 | -552.849 | 153.6113 | 552.849 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -164.4818 | 3.0565 | 31.9331 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 361.7634 | 162.978 | -132.5774 | 172.8594 | 519.2942 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1188.7711 | 919.2516 | -229.5539 | 324.5261 | 930.787 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 114.7716 | 19.9522 | -22.1983 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 178.35 | 131.9424 | 307.1487 | 145.7753 | 448.9057 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -383.5675 | 424.1536 | 201.9739 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 30.436 | 7.3464 | -232.1776 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 124.9139 | 23.8364 | -20.7535 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1206.1232 | 892.0529 | -226.1443 | 325.2138 | 931.4747 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 250.2092 | 161.2199 | 110.5659 | 148.6231 | 451.7536 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -156.561 | 2.6676 | 32.0759 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 176.5104 | 121.48 | -310.2554 | 145.7024 | 448.8328 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -342.3968 | 381.0247 | 192.7158 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 24.2118 | 4.1719 | 216.2196 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 645.03 | 206] [0.9 DL + 1.5 RSX] | 438.8798 | 137.6298 | -547.1542 | 156.1003 | 547.1542 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 456.6356 | -1.7541 | 6.04 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 456.6356 | 29.8653 | 11.31 | 5 |
| Top–Left | Leg 2 | 0 | 203] 1.5 [DL + RSY] | 1340.8183 | -0.6053 | 2.8 | 5 |
| Top–Right | Leg 2 | 0 | 203] 1.5 [DL + RSY] | 1340.8183 | 102.802 | 3.33 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1354.2762 | -461.0132 | 2.4 | 5 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1589.5829 | 245.0671 | 2.31 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 291.3827 | -20.1642 | 2.77 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 414.7352 | 5.4319 | 2.85 | 5 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1036.3634 | -91.068 | 3.09 | 5 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1036.3634 | 81.9903 | 3.03 | 5 |
| Top–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 1714.416 | -386.3831 | 5.28 | 5 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1714.416 | 66.0839 | 3.75 | 5 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 169.64 | -7.0477 | 3.44 | 5 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 169.64 | 7.2989 | 3.49 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 420.4073 | -3.0218 | 2.77 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 420.4073 | 0.0564 | 2.63 | 5 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1410.9074 | -469.4924 | 2.48 | 5 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1649.3577 | 281.2255 | 2.44 | 5 |
| Top–Left | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 1187.2867 | -66.9745 | 3.28 | 5 |
| Top–Right | Leg 10 | 0 | 203] 1.5 [DL + RSY] | 1187.2867 | 14.2515 | 2.92 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 452.6165 | -1.5844 | 5.95 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 452.6165 | 29.4832 | 11.19 | 5 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1056.8583 | -80.8718 | 3.07 | 5 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1056.8583 | 93.2768 | 3.15 | 5 |
| Top–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 1716.0647 | -355.4928 | 5.14 | 5 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1716.0647 | 98.4647 | 3.9 | 5 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 197.2843 | -6.7783 | 3.74 | 5 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 197.2843 | 7.5781 | 3.89 | 5 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 661.1153 | -52.167 | 1.93 | 5 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 785.0721 | 5.1155 | 1.9 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 269.7788 | -29.0941 | 8.83 | 5 |
| Botttom–Right | Leg 1 | 0 | 202] 1.5 [DL + RSX] | 269.7788 | 3.0565 | 3.95 | 5 |
| Bottom–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1521.6231 | -237.0819 | 4.4 | 5 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1521.6231 | 162.978 | 4.02 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1623.4548 | -642.6767 | 3.03 | 5 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1891.323 | 204.2575 | 2.6 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 449.7076 | -1.814 | 2.9 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 316.0533 | 19.9522 | 2.91 | 5 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1225.7549 | -123.6299 | 3.76 | 5 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1225.7549 | 131.9424 | 3.82 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1378.6055 | -54.7402 | 3.02 | 5 |
| Botttom–Right | Leg 6 | 300 | 206] [0.9 DL + 1.5 RSX] | 1627.365 | 424.1536 | 5.29 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 369.7863 | -5.5775 | 5.67 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 369.7863 | 8.5458 | 6.22 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 456.4401 | -1.3984 | 2.92 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 456.4401 | 2.4046 | 2.97 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1633.8213 | -663.3701 | 3.07 | 5 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1908.4131 | 164.3878 | 2.55 | 5 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1391.2748 | -105.5307 | 4.03 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1391.2748 | 161.2199 | 4.41 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 278.5923 | -28.8683 | 8.9 | 5 |
| Botttom–Right | Leg 11 | 0 | 202] 1.5 [DL + RSX] | 278.5923 | 2.6676 | 3.98 | 5 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1234.2444 | -134.5757 | 3.85 | 5 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1234.2444 | 121.48 | 3.77 | 5 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1683.4412 | -16.973 | 3.45 | 5 |
| Botttom–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 1683.4412 | 381.0247 | 5.2 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 359.5224 | -8.3867 | 6.07 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 359.5224 | 5.8726 | 5.6 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 908.7587 | -5.2501 | 2.2 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 908.7587 | 0.7541 | 2.17 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 23F(+73.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.203 | 202] 1.5 [DL + RSX] | 9828.8027 | 1202.7691 | 14913.8413 |
| Bottom | 0.226 | 202] 1.5 [DL + RSX] | 10475.9366 | 1286.4551 | 17110.5525 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 42.1584 | 29.8168 | 36.6636 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 320.6132 | 229.8527 | -133.3128 | 171.2286 | 517.6634 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1189.2573 | 903.384 | -216.6921 | 324.5454 | 930.8063 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 148.5588 | 28.2902 | -24.9505 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 182.2123 | 84.3532 | 305.4915 | 145.9284 | 449.0588 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -78.5048 | 95.3966 | 211.2145 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -31.0012 | 2.4412 | -203.309 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 155.452 | 22.5666 | 23.0483 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1207.0186 | 924.0719 | -215.6631 | 325.2493 | 931.5101 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 255.3231 | 11.1814 | 107.2903 | 148.8258 | 451.9562 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 35.4846 | 29.4075 | 37.1434 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 180.7228 | 99.1276 | -306.5708 | 145.8693 | 448.9998 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -102.062 | 124.8275 | 199.0705 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -70.238 | 6.1294 | 223.0466 | 18.5891 | 76.3282 |
| Top | Leg 15 | 638.05 | 206] [0.9 DL + 1.5 RSX] | 444.1259 | 83.9326 | -543.1331 | 156.3082 | 543.1331 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -199.2129 | 4.7144 | 35.8193 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 407.8321 | 221.2105 | -132.082 | 174.6851 | 521.1199 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1381.0171 | 1011.4249 | -212.0883 | 332.1449 | 938.4058 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 146.3685 | 24.9213 | -22.9505 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 242.8772 | 145.3826 | 272.3157 | 148.3326 | 451.463 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -391.5459 | 432.6174 | 210.3649 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | 68.7324 | 2.7303 | -198.6552 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 153.0499 | 28.6359 | -22.1151 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1392.2536 | 993.8805 | -210.816 | 332.5903 | 938.8511 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 271.9011 | 193.22 | 111.5107 | 149.4828 | 452.6132 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -195.5874 | 4.0897 | 36.2833 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 228.6536 | 145.8509 | -271.5492 | 147.7689 | 450.8993 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -380.4467 | 391.081 | 198.8596 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 14.27 | 5.2409 | 217.6076 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 511.88 | 206] [0.9 DL + 1.5 RSX] | 507.9746 | 137.884 | -469.1739 | 158.8385 | 469.1739 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 470.8494 | -2.308 | 6.32 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 470.8494 | 29.8168 | 11.48 | 5 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1517.157 | -131.8018 | 3.85 | 5 |
| Top–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1528.9038 | 97.7832 | 3.69 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1623.013 | -588.8331 | 2.93 | 5 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1893.6986 | 214.0644 | 2.62 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 356.6361 | -20.6151 | 3.2 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 500.3762 | 4.718 | 3.35 | 5 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1237.7828 | -100.6779 | 3.63 | 5 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1237.7828 | 84.3532 | 3.52 | 5 |
| Top–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 1989.6671 | -393.7302 | 5.87 | 5 |
| Top–Right | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 1989.6671 | 95.3966 | 4.44 | 5 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 228.4431 | -7.1643 | 4.2 | 5 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 228.4431 | 7.3247 | 4.23 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 504.3088 | -0.368 | 3.17 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 400.4743 | 0.3681 | 2.52 | 5 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1666.6764 | -594.8777 | 3 | 5 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1940.0081 | 244.3962 | 2.73 | 5 |
| Top–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1371.6422 | -153.7178 | 4.31 | 5 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1371.6422 | 99.593 | 3.94 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 464.3634 | -2.0833 | 6.2 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 464.3634 | 29.4075 | 11.32 | 5 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1246.8248 | -86.4654 | 3.56 | 5 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1246.8248 | 99.1276 | 3.64 | 5 |
| Top–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 1970.0343 | -365.0573 | 5.69 | 5 |
| Top–Right | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1970.0343 | 124.8275 | 4.54 | 5 |
| Top–Left | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 250.0668 | -7.1257 | 4.46 | 5 |
| Top–Right | Leg 14 | 0 | 202] 1.5 [DL + RSX] | 250.0668 | 7.4208 | 4.52 | 5 |
| Top–Left | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 762.4161 | -63.34 | 2.25 | 5 |
| Top–Right | Leg 15 | 0 | 204] 1.2 [DL + LL + RSX] | 907.3987 | 3.9339 | 2.19 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 355.4256 | -30.1338 | 10.09 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 355.4256 | 4.7144 | 5.33 | 5 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 1710.3599 | -292.2393 | 5.09 | 5 |
| Botttom–Right | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1710.3599 | 221.2105 | 4.72 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1895.6559 | -759.3455 | 3.55 | 5 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2178.9547 | 191.8393 | 2.92 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 537.6504 | -1.9776 | 3.45 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 377.0985 | 24.9213 | 3.53 | 5 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1416.7987 | -150.9934 | 4.4 | 5 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1416.7987 | 145.3826 | 4.36 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1643.4865 | -56.6997 | 3.56 | 5 |
| Botttom–Right | Leg 6 | 300 | 206] [0.9 DL + 1.5 RSX] | 1956.4716 | 432.6174 | 5.99 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 397.9224 | -7.0493 | 6.3 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 397.9224 | 8.9023 | 6.64 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 542.7405 | -1.3441 | 3.46 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 542.7405 | 2.0964 | 3.49 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1895.3313 | -780.8648 | 3.58 | 5 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2188.8247 | 205.9344 | 2.96 | 5 |
| Bottom–Left | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1555.927 | -145.4912 | 4.69 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1555.927 | 193.22 | 5.02 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 358.0339 | -29.897 | 10.08 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 358.0339 | 4.0897 | 5.24 | 5 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1414.281 | -151.2758 | 4.4 | 5 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1414.281 | 145.8509 | 4.36 | 5 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 1986.4867 | -19.4406 | 4.07 | 5 |
| Botttom–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 1986.4867 | 391.081 | 5.85 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 388.7251 | -8.907 | 6.53 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 388.7251 | 7.0582 | 6.18 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1033.7149 | -5.4069 | 2.5 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1033.7149 | 0.4154 | 2.46 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 22F(+70.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.232 | 202] 1.5 [DL + RSX] | 11368.4575 | 1155.6978 | -17145.2587 |
| Bottom | 0.247 | 202] 1.5 [DL + RSX] | 12015.5914 | 1087.7356 | 18119.7898 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 203] 1.5 [DL + RSY] | 172.1982 | 21.0944 | 32.3705 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 381.29 | 304.5927 | -151.0175 | 173.6333 | 520.068 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1382.8572 | 1000.6381 | -193.1683 | 332.2179 | 938.4787 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 180.9255 | 33.2557 | -26.1704 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 245.2036 | 99.3663 | 236.9654 | 148.4248 | 451.5552 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -48.949 | 110.3068 | 155.0592 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | -32.4551 | 1.8166 | -206.506 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 184.7214 | 28.1088 | 25.7042 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1394.0602 | 1026.9902 | -191.6394 | 332.6619 | 938.9227 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 252.9493 | 166.0038 | 140.0598 | 148.7317 | 451.8622 |
| Top | Leg 11 | 500 | 203] 1.5 [DL + RSY] | 160.1713 | 20.8685 | 33.0747 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 231.6466 | 124.4272 | -230.2118 | 147.8875 | 451.0179 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -96.7563 | 131.678 | 145.6549 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -60.1191 | 6.3797 | 230.9834 | 18.5891 | 76.3282 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 858.3191 | 94.9892 | -463.0449 | 172.7229 | 475.8533 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -151.1891 | 4.7976 | 28.1688 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 473.0837 | 202.4099 | -145.0983 | 177.2711 | 523.7059 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1598.6033 | 1088.5041 | -189.7745 | 340.768 | 947.0289 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 192.7518 | 25.0101 | -24.4025 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 295.1785 | 146.5322 | 218.3406 | 150.4053 | 453.5357 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -314.3207 | 402.4432 | 156.5791 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 48.6245 | 7.2795 | -235.9126 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 195.6231 | 28.0144 | 24.453 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1597.227 | 1076.2695 | -186.4735 | 340.7135 | 946.9743 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 325.5844 | 173.425 | 143.7746 | 151.6103 | 454.7407 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -150.1676 | 4.2812 | 28.8265 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 274.2575 | 127.2796 | -209.6665 | 149.5762 | 452.7066 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -313.7768 | 369.1264 | 147.82 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 39.0763 | 5.6947 | 223.3401 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 963.4733 | 139.3083 | -411.8764 | 176.8902 | 480.0207 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 505.6237 | -3.5622 | 6.99 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 505.6237 | 31.1155 | 12.15 | 5 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1719.1187 | -227.3765 | 4.77 | 5 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 1719.1187 | 304.5927 | 5.17 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 1895.7324 | -710.0254 | 3.46 | 5 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2181.6264 | 211.416 | 2.96 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 416.0067 | -27.8467 | 3.91 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 582.9754 | 3.6789 | 3.82 | 5 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1426.3965 | -130.7894 | 4.29 | 5 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1426.3965 | 99.3663 | 4.07 | 5 |
| Top–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2295.0228 | -365.1514 | 6.34 | 5 |
| Top–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2295.0228 | 110.3068 | 5.12 | 5 |
| Top–Left | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 267.0416 | -7.7706 | 4.8 | 5 |
| Top–Right | Leg 7 | 0 | 202] 1.5 [DL + RSX] | 267.0416 | 8.174 | 4.87 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 585.5494 | -0.5605 | 3.69 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 464.4203 | 0.4466 | 2.92 | 5 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 1928.7147 | -713.1229 | 3.51 | 5 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2214.9592 | 238.0719 | 3.04 | 5 |
| Top–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1553.362 | -210.6691 | 5.13 | 5 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1553.362 | 166.0038 | 4.83 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 497.4084 | -3.2745 | 6.83 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 497.4084 | 30.6167 | 11.96 | 5 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1424.7051 | -105.6944 | 4.11 | 5 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1424.7051 | 124.4272 | 4.24 | 5 |
| Top–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2256.0778 | -343.2775 | 6.16 | 5 |
| Top–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2256.0778 | 131.678 | 5.14 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 286.3454 | -8.4252 | 5.16 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 286.3454 | 7.8767 | 5.06 | 5 |
| Top–Left | Leg 15 | 0 | 202] 1.5 [DL + RSX] | 866.5586 | -92.112 | 2.69 | 5 |
| Top–Right | Leg 15 | 0 | 202] 1.5 [DL + RSX] | 1032.6487 | 2.6441 | 2.48 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 340.6259 | -31.3781 | 10.14 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 340.6259 | 4.7976 | 5.16 | 5 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 1905.0655 | -255.6787 | 5.3 | 5 |
| Botttom–Right | Leg 2 | 200 | 202] 1.5 [DL + RSX] | 1905.0655 | 202.4099 | 5.02 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2179.2252 | -862.6818 | 4.06 | 5 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2488.4539 | 178.8843 | 3.27 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 623.6109 | -0.9717 | 3.94 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 440.099 | 25.0101 | 3.92 | 5 |
| Bottom–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1592.7845 | -130.3653 | 4.68 | 5 |
| Botttom–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1592.7845 | 146.5322 | 4.79 | 5 |
| Bottom–Left | Leg 6 | 0 | 206] [0.9 DL + 1.5 RSX] | 1792.312 | -71.8901 | 3.93 | 5 |
| Botttom–Right | Leg 6 | 300 | 206] [0.9 DL + 1.5 RSX] | 2161.8098 | 402.4432 | 6.26 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 439.5572 | -7.0114 | 6.81 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 439.5572 | 8.756 | 7.14 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 625.7856 | -0.7729 | 3.95 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 625.7856 | 2.4913 | 4.03 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2167.1498 | -883.0858 | 4.08 | 5 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2492.647 | 152.3558 | 3.23 | 5 |
| Bottom–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1720.9468 | -137.3778 | 5.03 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1720.9468 | 173.425 | 5.28 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 342.449 | -31.0192 | 10.1 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 342.449 | 4.2812 | 5.08 | 5 |
| Bottom–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1585.049 | -149.9427 | 4.79 | 5 |
| Botttom–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1585.049 | 127.2796 | 4.64 | 5 |
| Bottom–Left | Leg 13 | 0 | 202] 1.5 [DL + RSX] | 2179.8065 | -35.2502 | 4.53 | 5 |
| Botttom–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2179.8065 | 369.1264 | 6.13 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 426.1594 | -8.5637 | 6.93 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 426.1594 | 7.5045 | 6.73 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1160.8939 | -5.5349 | 2.8 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1160.8939 | 0.4038 | 2.77 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 21F(+67.55) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.256 | 202] 1.5 [DL + RSX] | 12910.8852 | 987.4001 | -18527.7918 |
| Bottom | 0.268 | 202] 1.5 [DL + RSX] | 13558.0191 | 975.3133 | -19249.8348 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 44.1078 | 31.6829 | 35.5297 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 459.3662 | 263.8956 | -132.0725 | 176.7275 | 523.1623 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1601.2466 | 1082.9282 | -173.1625 | 340.8728 | 947.1336 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 227.758 | 28.295 | -24.6619 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 298.0399 | 118.1324 | 226.0234 | 150.5187 | 453.6491 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -6.0307 | 82.8916 | 164.2798 | 165.1276 | 525.9972 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | 1.6955 | 1.6066 | -203.274 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 228.1443 | 22.5394 | 24.2977 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1599.5968 | 1113.771 | -173.6913 | 340.8074 | 947.0683 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 315.8944 | 122.6719 | 121.2589 | 151.2263 | 454.3567 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 36.3274 | 31.1948 | 36.0163 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 278.0645 | 124.1992 | -216.0953 | 149.7271 | 452.8575 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -59.3598 | 109.1203 | 153.6315 | 165.1276 | 525.9972 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -39.0979 | 6.2745 | 226.4615 | 18.5891 | 76.3282 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 972.6523 | 107.9992 | -411.5189 | 177.254 | 480.3844 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -119.7159 | 4.9005 | 29.3287 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 553.9845 | 211.5389 | -127.8976 | 180.4773 | 526.912 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1802.1768 | 1143.5169 | -173.4249 | 348.8358 | 955.0966 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 237.0651 | 24.361 | -22.7638 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 373.7287 | 146.5359 | 221.6119 | 153.5183 | 456.6487 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -207.7528 | 413.8983 | 165.8165 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 59.4541 | 7.2563 | -232.6658 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 236.6933 | 27.8071 | 22.9154 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1791.5498 | 1136.3322 | -171.1106 | 348.4146 | 954.6755 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 392.5936 | 183.6963 | 127.4342 | 154.2659 | 457.3964 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -120.9245 | 4.4161 | 30.1073 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 348.647 | 134.949 | -212.2469 | 152.5243 | 455.6547 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -217.5052 | 384.6171 | 154.7655 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 48.5157 | 5.7482 | 221.8343 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 1076.2871 | 141.484 | -428.3572 | 181.3611 | 484.4916 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 549.38 | -4.0575 | 7.63 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 549.38 | 31.6829 | 12.81 | 5 |
| Top–Left | Leg 2 | 0 | 202] 1.5 [DL + RSX] | 1907.8847 | -173.5029 | 4.88 | 5 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 1907.8847 | 263.8956 | 5.35 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2179.0294 | -818.545 | 3.99 | 5 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2492.4289 | 196.0156 | 3.3 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 477.8722 | -21.9933 | 4.02 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 666.5952 | 3.797 | 4.34 | 5 |
| Top–Left | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1601.2829 | -129.2931 | 4.69 | 5 |
| Top–Right | Leg 5 | 0 | 202] 1.5 [DL + RSX] | 1601.2829 | 118.1324 | 4.62 | 5 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2515.4394 | -378.114 | 6.85 | 5 |
| Top–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2515.4394 | 82.8916 | 5.43 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 323.4898 | -7.6535 | 5.48 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 323.4898 | 7.1647 | 5.39 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 666.5067 | -0.9963 | 4.21 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 524.9148 | 0.039 | 3.28 | 5 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2200.4649 | -819.4378 | 4.01 | 5 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2519.7622 | 228.7896 | 3.39 | 5 |
| Top–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1713.5488 | -176.8678 | 5.28 | 5 |
| Top–Right | Leg 10 | 0 | 202] 1.5 [DL + RSX] | 1713.5488 | 122.6719 | 4.91 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 540.8447 | -3.6966 | 7.45 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 540.8447 | 31.1948 | 12.61 | 5 |
| Top–Left | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1594.67 | -123.5306 | 4.64 | 5 |
| Top–Right | Leg 12 | 0 | 202] 1.5 [DL + RSX] | 1594.67 | 124.1992 | 4.64 | 5 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2470.0503 | -353.211 | 6.64 | 5 |
| Top–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2470.0503 | 109.1203 | 5.46 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 336.1726 | -7.4168 | 5.59 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 336.1726 | 7.6192 | 5.63 | 5 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1159.5904 | -0.8739 | 2.77 | 5 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1159.5904 | 1.4862 | 2.77 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 364.9825 | -31.3228 | 10.44 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 364.9825 | 4.9005 | 5.48 | 5 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2067.8263 | -266.864 | 5.7 | 5 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2067.8263 | 211.5389 | 5.41 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2446.6728 | -947.3943 | 4.52 | 5 |
| Botttom–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2765.4325 | 167.8138 | 3.58 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 700.2539 | -1.1056 | 4.43 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 496.5145 | 24.361 | 4.25 | 5 |
| Bottom–Left | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1750.4531 | -137.7484 | 5.1 | 5 |
| Botttom–Right | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1750.4531 | 146.5359 | 5.16 | 5 |
| Bottom–Left | Leg 6 | 0 | 202] 1.5 [DL + RSX] | 2383.3995 | -15.1888 | 4.84 | 5 |
| Botttom–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2383.3995 | 413.8983 | 6.75 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 471.1872 | -6.9861 | 7.2 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 471.1872 | 8.7447 | 7.53 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 700.0398 | -0.3655 | 4.39 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 700.0398 | 2.9927 | 4.52 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2427.1339 | -963.7651 | 4.53 | 5 |
| Botttom–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2764.1599 | 139.5434 | 3.53 | 5 |
| Bottom–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1861.0016 | -145.6719 | 5.42 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1861.0016 | 183.6963 | 5.68 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 366.0919 | -30.8856 | 10.37 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 366.0919 | 4.4161 | 5.4 | 5 |
| Bottom–Left | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1739.0097 | -149.2935 | 5.16 | 5 |
| Botttom–Right | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1739.0097 | 134.949 | 5.06 | 5 |
| Bottom–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2390.5903 | -55.2667 | 5.05 | 5 |
| Botttom–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2390.5903 | 384.6171 | 6.63 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 456.6289 | -8.4509 | 7.29 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 456.6289 | 7.5485 | 7.12 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1286.5256 | -5.8188 | 3.1 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1286.5256 | 0.2441 | 3.06 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 20F(+64.4) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.278 | 202] 1.5 [DL + RSX] | 14437.638 | 896.6029 | -19634.4681 |
| Bottom | 0.286 | 202] 1.5 [DL + RSX] | 15084.7719 | 879.386 | -19946.5476 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 44.6788 | 31.5912 | 37.7098 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 554.058 | 263.986 | -117.6999 | 180.4802 | 526.9149 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 1803.5943 | 1141.4555 | -158.3664 | 348.8919 | 955.1528 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 272.0484 | 30.0756 | -25.6469 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 378.0421 | 127.3305 | 247.3049 | 153.6892 | 456.8197 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 68.5939 | 86.5921 | 175.3655 | 167.846 | 528.7156 |
| Top | Leg 7 | OS | 205] 1.2 [DL + LL + RSY] | 16.1105 | 1.9017 | -199.8801 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 269.2963 | 24.8346 | 25.3151 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1793.0909 | 1178.9833 | -160.5004 | 348.4757 | 954.7366 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 392.8674 | 122.3958 | 104.6947 | 154.2768 | 457.4072 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 36.6415 | 31.0428 | 38.2514 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 353.7622 | 138.6062 | -238.1412 | 152.727 | 455.8574 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 10.2235 | 112.1487 | 166.035 | 165.5328 | 526.4023 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | -20.2282 | 6.3851 | 225.6487 | 18.5891 | 76.3282 |
| Top | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 1085.2185 | 121.9585 | -432.688 | 181.7151 | 484.8455 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -99.5087 | 5.7868 | 30.8972 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 648.2606 | 219.3551 | -116.0968 | 184.2135 | 530.6483 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2002.3527 | 1175.7914 | -161.4105 | 356.7689 | 963.0297 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 281.5774 | 25.2613 | -23.2287 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 466.4363 | 148.3255 | 245.6036 | 157.1924 | 460.3228 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -92.7376 | 417.828 | 175.2792 | 165.1276 | 525.9972 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 72.5594 | 7.5793 | -229.8751 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 278.5734 | 28.1602 | 23.4308 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1986.7686 | 1173.6148 | -160.6016 | 356.1513 | 962.4121 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 471.1743 | 190.6977 | 115.7096 | 157.3801 | 460.5106 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -102.2927 | 5.3263 | 31.7377 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 438.2665 | 140.4566 | -237.1194 | 156.076 | 459.2064 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -112.3064 | 393.2486 | 165.3994 | 165.1276 | 525.9972 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 60.8302 | 5.8424 | 220.3972 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 509.94 | 206] [0.9 DL + 1.5 RSX] | 710.9211 | 143.411 | -476.0392 | 166.8814 | 476.0392 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 593.8178 | -5.0205 | 8.36 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 593.8178 | 31.5912 | 13.35 | 5 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2065.2493 | -175.7715 | 5.22 | 5 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2065.2493 | 263.986 | 5.68 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2445.4102 | -909.3823 | 4.46 | 5 |
| Top–Right | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2766.6434 | 180.5705 | 3.6 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 534.0016 | -24.2976 | 4.48 | 5 |
| Top–Right | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 741.9392 | 3.5413 | 4.8 | 5 |
| Top–Left | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1758.6833 | -143.2521 | 5.16 | 5 |
| Top–Right | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1758.6833 | 127.3305 | 5.05 | 5 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2742.5409 | -366.3754 | 7.24 | 5 |
| Top–Right | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2742.5409 | 86.5921 | 5.9 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 353.889 | -7.8136 | 5.89 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 353.889 | 7.8084 | 5.89 | 5 |
| Top–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 739.5975 | -0.8387 | 4.66 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 578.9424 | 0.094 | 3.62 | 5 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2460.0005 | -906.2747 | 4.47 | 5 |
| Top–Right | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2787.6517 | 224.5884 | 3.7 | 5 |
| Top–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1849.3985 | -175.1886 | 5.6 | 5 |
| Top–Right | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1849.3985 | 122.3958 | 5.24 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 584.239 | -4.6932 | 8.18 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 584.239 | 31.0428 | 13.12 | 5 |
| Top–Left | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1748.3538 | -132.4428 | 5.06 | 5 |
| Top–Right | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1748.3538 | 138.6062 | 5.11 | 5 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2691.9786 | -342.7348 | 7.03 | 5 |
| Top–Right | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2691.9786 | 112.1487 | 5.92 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 363.1034 | -7.9728 | 6.03 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 363.1034 | 7.804 | 6 | 5 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1283.9632 | -1.4287 | 3.07 | 5 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1283.9632 | 0.6903 | 3.06 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 394.6961 | -31.1867 | 10.78 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 394.6961 | 5.7868 | 6.02 | 5 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2223.2898 | -275.8374 | 6.07 | 5 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2223.2898 | 219.3551 | 5.77 | 5 |
| Bottom–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2707.9668 | -1003.8526 | 4.93 | 5 |
| Botttom–Right | Leg 3 | 400 | 203] 1.5 [DL + RSY] | 2707.9668 | 1175.7914 | 5.22 | 5 |
| Bottom–Left | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 767.3917 | -0.8667 | 4.84 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 549.7729 | 25.2613 | 4.62 | 5 |
| Bottom–Left | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1896.8708 | -143.4598 | 5.49 | 5 |
| Botttom–Right | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1896.8708 | 148.3255 | 5.53 | 5 |
| Bottom–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2582.3578 | -34.3668 | 5.33 | 5 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2582.3578 | 417.828 | 7.17 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 502.5087 | -7.1399 | 7.62 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 502.5087 | 9.143 | 8 | 5 |
| Bottom–Left | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 765.1625 | -0.6624 | 4.81 | 5 |
| Botttom–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 765.1625 | 2.7724 | 4.91 | 5 |
| Bottom–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2684.2086 | -1014.9433 | 4.92 | 5 |
| Botttom–Right | Leg 9 | 400 | 203] 1.5 [DL + RSY] | 2684.2086 | 1173.6148 | 5.19 | 5 |
| Bottom–Left | Leg 10 | 200 | 202] 1.5 [DL + RSX] | 1995.5678 | -151.4823 | 5.78 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 1995.5678 | 190.6977 | 6.05 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 394.1431 | -30.6892 | 10.68 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 394.1431 | 5.3263 | 5.93 | 5 |
| Bottom–Left | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1882.4225 | -151.2507 | 5.51 | 5 |
| Botttom–Right | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1882.4225 | 140.4566 | 5.44 | 5 |
| Bottom–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2580.1482 | -69.0348 | 5.49 | 5 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2580.1482 | 393.2486 | 7.05 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 487.2033 | -8.867 | 7.75 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 487.2033 | 7.669 | 7.53 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1408.9094 | -6.0486 | 3.4 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1408.9094 | 0.121 | 3.36 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 19F(+61.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.298 | 202] 1.5 [DL + RSX] | 15948.4466 | 818.7556 | -20434.6128 |
| Bottom | 0.303 | 202] 1.5 [DL + RSX] | 16595.5805 | 801.3128 | -20403.104 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 50.5725 | 31.7918 | 39.4453 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 658.426 | 271.4122 | -114.5692 | 184.6163 | 531.0511 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2004.0952 | 1178.329 | -153.2572 | 356.8379 | 963.0988 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 316.8393 | 31.6022 | -26.8086 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 471.1578 | 135.0533 | 276.6315 | 157.3795 | 460.5099 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 158.9653 | 99.0957 | 187.0407 | 171.4275 | 532.2971 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | -1.2773 | 6.6809 | -236.5087 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 311.5698 | 26.2715 | 26.5969 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 1988.464 | 1222.4084 | -157.8683 | 356.2184 | 962.4793 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 478.2937 | 129.1306 | 99.2711 | 157.6623 | 460.7927 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 41.8006 | 31.2194 | 39.9762 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 443.6878 | 150.1568 | -268.5127 | 156.2908 | 459.4212 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 95.7307 | 123.9214 | 178.062 | 168.9215 | 529.791 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 0.508 | 6.6114 | 226.1332 | 18.5891 | 76.3282 |
| Top | Leg 15 | 518.76 | 206] [0.9 DL + 1.5 RSX] | 716.2022 | 133.9102 | -481.5948 | 167.0907 | 481.5948 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -80.2636 | 6.7859 | 31.7533 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 753.1447 | 224.0263 | -112.7425 | 188.3701 | 534.8049 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2204.8388 | 1183.7661 | -161.3734 | 364.7935 | 971.0544 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 326.3247 | 26.4824 | 24.3633 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 566.6364 | 150.1013 | 271.5016 | 161.1633 | 464.2938 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 31.1234 | 418.2635 | 187.7442 | 166.361 | 527.2306 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 87.6931 | 7.8993 | -227.8505 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 321.5923 | 28.9223 | -24.5228 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2185.8165 | 1184.2453 | -162.263 | 364.0396 | 970.3005 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 559.5383 | 192.2764 | 111.3748 | 160.882 | 464.0125 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -84.1566 | 6.3049 | 32.6346 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 535.43 | 142.4241 | -263.8983 | 159.9266 | 463.057 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 2.5743 | 396.745 | 178.1423 | 165.2296 | 526.0992 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 75.6504 | 6.1128 | 219.5534 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 594.98 | 206] [0.9 DL + 1.5 RSX] | 778.9571 | 144.3418 | -530.293 | 169.5777 | 530.293 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 626.8372 | -5.8921 | 8.94 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 626.8372 | 31.7918 | 13.8 | 5 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2218.1486 | -186.274 | 5.59 | 5 |
| Top–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2244.5746 | 104.3387 | 5.22 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 0 | 203] 1.5 [DL + RSY] | 2706.601 | -972.4697 | 4.88 | 5 |
| Top–Right | Leg 3 | 400 | 203] 1.5 [DL + RSY] | 2706.601 | 1178.329 | 5.23 | 5 |
| Top–Left | Leg 4 | 0 | 202] 1.5 [DL + RSX] | 586.904 | -25.9697 | 4.89 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 807.7747 | 3.5542 | 5.22 | 5 |
| Top–Left | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1904.2188 | -154.7454 | 5.59 | 5 |
| Top–Right | Leg 5 | 200 | 202] 1.5 [DL + RSX] | 1904.2188 | 135.0533 | 5.45 | 5 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2939.5115 | -365.1895 | 7.63 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2939.5115 | 99.0957 | 6.35 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 385.1013 | -8.1609 | 6.34 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 385.1013 | 8.4498 | 6.4 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 803.5331 | -0.9157 | 5.07 | 5 |
| Top–Right | Leg 8 | 0 | 203] 1.5 [DL + RSY] | 624.149 | 0.0776 | 3.9 | 5 |
| Top–Left | Leg 9 | 0 | 203] 1.5 [DL + RSY] | 2717.5244 | -964.7886 | 4.88 | 5 |
| Top–Right | Leg 9 | 400 | 203] 1.5 [DL + RSY] | 2717.5244 | 1222.4084 | 5.31 | 5 |
| Top–Left | Leg 10 | 300 | 203] 1.5 [DL + RSY] | 1941.1414 | -74.4697 | 5.13 | 5 |
| Top–Right | Leg 10 | 300 | 203] 1.5 [DL + RSY] | 1982.4493 | 129.1306 | 5.6 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 616.3257 | -5.5486 | 8.74 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 616.3257 | 31.2194 | 13.56 | 5 |
| Top–Left | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1890.937 | -140.2563 | 5.46 | 5 |
| Top–Right | Leg 12 | 200 | 202] 1.5 [DL + RSX] | 1890.937 | 150.1568 | 5.52 | 5 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2884.3871 | -341.7143 | 7.41 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2884.3871 | 123.9214 | 6.36 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 391.5514 | -8.6204 | 6.51 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 391.5514 | 8.116 | 6.42 | 5 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1405.0711 | -1.6604 | 3.36 | 5 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1405.0711 | 0.2781 | 3.35 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 424.9091 | -31.3281 | 11.19 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 424.9091 | 6.7859 | 6.58 | 5 |
| Bottom–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2367.9866 | -278.0175 | 6.38 | 5 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2367.9866 | 224.0263 | 6.1 | 5 |
| Bottom–Left | Leg 3 | 400 | 203] 1.5 [DL + RSY] | 2968.2263 | -1028.6962 | 5.28 | 5 |
| Botttom–Right | Leg 3 | 400 | 203] 1.5 [DL + RSY] | 2968.2263 | 1183.7661 | 5.55 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 824.5319 | -0.6323 | 5.18 | 5 |
| Botttom–Right | Leg 4 | 0 | 203] 1.5 [DL + RSY] | 599.6973 | 26.4824 | 4.99 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2031.1384 | -145.8605 | 5.83 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2031.1384 | 150.1013 | 5.86 | 5 |
| Bottom–Left | Leg 6 | 300 | 202] 1.5 [DL + RSX] | 2760.0781 | -52.4851 | 5.77 | 5 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2760.0781 | 418.2635 | 7.53 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 529.8095 | -7.4961 | 8.03 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 529.8095 | 9.5453 | 8.41 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 820.8362 | -0.8856 | 5.17 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 820.8362 | 2.6599 | 5.25 | 5 |
| Bottom–Left | Leg 9 | 400 | 203] 1.5 [DL + RSY] | 2941.415 | -1035.3767 | 5.26 | 5 |
| Botttom–Right | Leg 9 | 400 | 203] 1.5 [DL + RSY] | 2941.415 | 1184.2453 | 5.52 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2119.6969 | -154.9926 | 6.1 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2119.6969 | 192.2764 | 6.35 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 422.7476 | -30.8039 | 11.06 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 422.7476 | 6.3049 | 6.47 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2013.8553 | -153.5 | 5.84 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2013.8553 | 142.4241 | 5.76 | 5 |
| Bottom–Left | Leg 13 | 300 | 202] 1.5 [DL + RSX] | 2749.6392 | -83.6219 | 5.9 | 5 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2749.6392 | 396.745 | 7.4 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 514.1456 | -9.2789 | 8.17 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 514.1456 | 8.0028 | 7.93 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1528.6586 | -0.0421 | 3.64 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1312.9943 | 143.0761 | 4.1 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 18F(+58.1) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.315 | 202] 1.5 [DL + RSX] | 17441.681 | 755.9 | -20932.9922 |
| Bottom | 0.319 | 202] 1.5 [DL + RSX] | 18088.8149 | 740.7614 | -20687.2153 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 61.606 | 31.9843 | 40.8232 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 769.7823 | 276.4879 | -112.9115 | 189.0295 | 535.4642 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2206.9024 | 1190.8734 | -162.1679 | 364.8753 | 971.1362 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 361.9535 | 33.1625 | -28.0618 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 571.7133 | 140.9231 | 301.8418 | 161.3645 | 464.495 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 265.1505 | 113.1093 | 197.3531 | 175.6357 | 536.5053 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 21.4857 | 7.1806 | -235.578 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 355.0326 | 27.777 | 27.8997 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2187.2456 | 1238.6423 | -168.971 | 364.0963 | 970.3572 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 618.2916 | 25.4162 | 98.6371 | 163.2105 | 466.3409 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 52.1964 | 31.3909 | 41.3393 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 541.1143 | 156.1069 | -294.6079 | 160.1519 | 463.2823 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 197.6148 | 135.8659 | 188.8905 | 172.9592 | 533.8288 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 21.3683 | 6.9234 | 226.3919 | 18.5891 | 76.3282 |
| Top | Leg 15 | 603.45 | 206] [0.9 DL + 1.5 RSX] | 784.2384 | 143.3413 | -535.6342 | 169.787 | 535.6342 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -61.4742 | 7.9158 | 32.4212 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 867.6071 | 227.1939 | -110.9771 | 192.9063 | 539.3411 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2404.9501 | 1169.734 | -173.6842 | 372.7241 | 978.9849 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 371.3783 | 27.8323 | 25.8332 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 672.8667 | 151.03 | 292.7931 | 165.3733 | 468.5037 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 161.5328 | 418.522 | 198.7659 | 171.5293 | 532.3988 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 104.4739 | 8.2231 | -226.0339 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 365.4504 | 29.9318 | -25.9177 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2383.2025 | 1171.4235 | -175.6835 | 371.8622 | 978.1231 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 656.5874 | 192.7621 | 108.8139 | 164.7282 | 467.8586 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -66.3048 | 7.4075 | 33.3401 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 638.6593 | 143.6479 | -286.0822 | 164.0177 | 467.1481 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 124.9398 | 399.3496 | 189.692 | 170.079 | 530.9486 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 92.3523 | 6.4597 | 218.8033 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 673.68 | 206] [0.9 DL + 1.5 RSX] | 846.5211 | 145.5633 | -580.6831 | 172.2553 | 580.6831 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 653.1321 | -6.9143 | 9.46 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 653.1321 | 31.9843 | 14.16 | 5 |
| Top–Left | Leg 2 | 300 | 203] 1.5 [DL + RSY] | 2385.7788 | -21.4618 | 5.08 | 5 |
| Top–Right | Leg 2 | 300 | 203] 1.5 [DL + RSY] | 2385.7788 | 106.85 | 5.53 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 400 | 203] 1.5 [DL + RSY] | 2966.6692 | -1003.8865 | 5.24 | 5 |
| Top–Right | Leg 3 | 400 | 203] 1.5 [DL + RSY] | 2966.6692 | 1190.8734 | 5.56 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 636.4591 | -27.5746 | 5.27 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 863.38 | 3.6422 | 5.57 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2037.7428 | -160.9517 | 5.95 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2037.7428 | 140.9231 | 5.81 | 5 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3108.1794 | -367.0217 | 7.98 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3108.1794 | 113.1093 | 6.76 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 415.627 | -8.5879 | 6.81 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 415.627 | 9.0588 | 6.89 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 857.7778 | -0.8997 | 5.4 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 633.8599 | 27.777 | 5.26 | 5 |
| Top–Left | Leg 9 | 400 | 203] 1.5 [DL + RSY] | 2975.2963 | -992.1852 | 5.23 | 5 |
| Top–Right | Leg 9 | 400 | 203] 1.5 [DL + RSY] | 2975.2963 | 1238.6423 | 5.65 | 5 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2107.6564 | -183.4939 | 6.27 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2107.6564 | 131.9836 | 5.92 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 641.8948 | -6.5505 | 9.25 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 641.8948 | 31.3909 | 13.91 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2021.6137 | -146.4689 | 5.81 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2021.6137 | 156.1069 | 5.88 | 5 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3049.1624 | -344.7115 | 7.75 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3049.1624 | 135.8659 | 6.75 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 420.001 | -9.2293 | 6.98 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 420.001 | 8.5266 | 6.85 | 5 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1523.3755 | -1.8695 | 3.64 | 5 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1523.3755 | 0.0168 | 3.63 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 456.0567 | -31.4844 | 11.6 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 456.0567 | 7.9158 | 7.18 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2502.9336 | -278.7324 | 6.67 | 5 |
| Botttom–Right | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2502.9336 | 227.1939 | 6.4 | 5 |
| Bottom–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3225.6804 | -1026.9436 | 5.59 | 5 |
| Botttom–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3225.6804 | 1169.734 | 5.83 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 873.5514 | -0.4458 | 5.48 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 647.1155 | 27.8323 | 5.35 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2154.9835 | -147.5575 | 6.13 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2154.9835 | 151.03 | 6.16 | 5 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2924.6561 | -70.0988 | 6.19 | 5 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 2924.6561 | 418.522 | 7.86 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 552.9265 | -7.9483 | 8.4 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 552.9265 | 9.9583 | 8.78 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 868.7915 | -1.0673 | 5.48 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 868.7915 | 2.5736 | 5.55 | 5 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3196.2584 | -1030.4855 | 5.56 | 5 |
| Botttom–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3196.2584 | 1171.4235 | 5.8 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2235.0333 | -157.1768 | 6.39 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2235.0333 | 192.7621 | 6.63 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 452.4065 | -30.9403 | 11.46 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 452.4065 | 7.4075 | 7.04 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2135.092 | -154.9778 | 6.14 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2135.092 | 143.6479 | 6.06 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2907.1001 | -98.3017 | 6.29 | 5 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 2907.1001 | 399.3496 | 7.73 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 537.1514 | -9.7062 | 8.53 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 537.1514 | 8.4262 | 8.29 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1644.341 | -0.247 | 3.92 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1425.4505 | 144.208 | 4.37 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 17F(+54.95) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.33 | 202] 1.5 [DL + RSX] | 18915.6469 | 708.0232 | -21195.1096 |
| Bottom | 0.333 | 202] 1.5 [DL + RSX] | 19562.7808 | 695.0562 | -20854.0131 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 76.1872 | 32.1749 | 41.9842 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 887.5618 | 279.9206 | -109.4545 | 193.6971 | 540.1319 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2407.1984 | 1180.6313 | -179.8078 | 372.8132 | 979.074 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 407.2459 | 34.6627 | -29.3178 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 678.2245 | 144.6578 | 322.0593 | 165.5857 | 468.7161 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 384.718 | 127.6785 | 205.8041 | 180.3742 | 541.2438 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 43.1356 | 7.6698 | -234.5126 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 399.1408 | 29.3105 | 29.1885 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2383.8662 | 1229.6 | -187.7488 | 371.8885 | 978.1494 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 733.5743 | 27.1871 | 105.1843 | 167.7792 | 470.9096 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 66.2308 | 31.5632 | 42.4877 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 644.5989 | 159.3082 | -315.6991 | 164.253 | 467.3835 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 313.5015 | 148.1112 | 197.9698 | 177.5519 | 538.4214 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 41.4305 | 7.2511 | 226.396 | 18.5891 | 76.3282 |
| Top | Leg 15 | 681.28 | 206] [0.9 DL + 1.5 RSX] | 851.7422 | 150.0477 | -585.4982 | 172.4623 | 585.4982 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -43.6491 | 9.1102 | 33.0043 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 989.2521 | 229.6445 | -107.1868 | 197.7272 | 544.162 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2599.8892 | 1141.5793 | -191.7072 | 380.4496 | 986.7105 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 416.3729 | 29.2499 | 27.3129 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 783.541 | 151.31 | 310.4273 | 169.7594 | 472.8898 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 295.4074 | 418.7618 | 207.7013 | 176.8348 | 537.7044 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 122.8903 | 8.5542 | -224.1 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 409.4685 | 31.0111 | -27.3343 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2576.087 | 1144.6637 | -194.1722 | 379.5063 | 985.7672 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 760.1257 | 192.5563 | 104.736 | 168.8314 | 471.9619 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -49.2683 | 8.5705 | 33.9514 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 746.4663 | 144.6379 | -304.6216 | 168.2901 | 471.4205 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 251.5441 | 401.5308 | 199.2544 | 175.0965 | 535.966 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 110.8129 | 6.815 | 217.835 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 746.15 | 206] [0.9 DL + 1.5 RSX] | 913.175 | 147.1644 | -627.2587 | 174.8969 | 627.2587 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 675.1165 | -8.0356 | 9.95 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 675.1165 | 32.1749 | 14.47 | 5 |
| Top–Left | Leg 2 | 300 | 203] 1.5 [DL + RSY] | 2507.7826 | -23.6014 | 5.35 | 5 |
| Top–Right | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 2502.1564 | 279.9206 | 6.67 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3223.7731 | -1007.9312 | 5.55 | 5 |
| Top–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3223.7731 | 1180.6313 | 5.85 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 683.6749 | -29.1926 | 5.64 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 910.5962 | 3.6719 | 5.86 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2160.9778 | -164.4862 | 6.26 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2160.9778 | 144.6578 | 6.13 | 5 |
| Top–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3256.5613 | -367.9224 | 8.28 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3256.5613 | 127.6785 | 7.13 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 445.8579 | -9.0235 | 7.27 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 445.8579 | 9.656 | 7.38 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 904.046 | -0.8385 | 5.69 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 680.4344 | 29.3105 | 5.63 | 5 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3230.849 | -992.6026 | 5.53 | 5 |
| Top–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3230.849 | 1229.6 | 5.94 | 5 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2226.3985 | -186.117 | 6.57 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2226.3985 | 134.3781 | 6.22 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 663.23 | -7.6476 | 9.72 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 663.23 | 31.5632 | 14.21 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2142.1929 | -150.576 | 6.12 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2142.1929 | 159.3082 | 6.18 | 5 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3194.3765 | -347.0899 | 8.05 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3194.3765 | 148.1112 | 7.1 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 448.5593 | -9.8233 | 7.45 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 448.5593 | 8.9543 | 7.29 | 5 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1637.5833 | -0.1527 | 3.9 | 5 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1434.8264 | 149.585 | 4.43 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 488.6479 | -31.6064 | 12.03 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 488.6479 | 9.1102 | 7.82 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2629.6414 | -278.4902 | 6.93 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2629.6414 | 229.6445 | 6.67 | 5 |
| Bottom–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3480.777 | -1007.6087 | 5.86 | 5 |
| Botttom–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3480.777 | 1141.5793 | 6.09 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 917.3678 | -0.2164 | 5.74 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 692.3446 | 29.2499 | 5.7 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2270.6817 | -148.9906 | 6.42 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2270.6817 | 151.31 | 6.44 | 5 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3080.781 | -87.161 | 6.58 | 5 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3080.781 | 418.7618 | 8.17 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 572.4075 | -8.4143 | 8.73 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 572.4075 | 10.3809 | 9.1 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 911.8785 | -1.2637 | 5.76 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 911.8785 | 2.4837 | 5.82 | 5 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3449.0218 | -1009.473 | 5.82 | 5 |
| Botttom–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3449.0218 | 1144.6637 | 6.05 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2343.105 | -158.7136 | 6.66 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2343.105 | 192.5563 | 6.89 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 483.5976 | -31.0481 | 11.87 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 483.5976 | 8.5705 | 7.65 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2248.5141 | -155.8181 | 6.41 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2248.5141 | 144.6379 | 6.34 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3057.0953 | -112.7959 | 6.66 | 5 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3057.0953 | 401.5308 | 8.04 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 556.6621 | -10.145 | 8.86 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 556.6621 | 8.86 | 8.62 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1756.1698 | -0.4633 | 4.18 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1536.4915 | 145.719 | 4.65 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 16F(+51.8) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.344 | 202] 1.5 [DL + RSX] | 20368.6133 | 672.8102 | -21272.3279 |
| Bottom | 0.347 | 202] 1.5 [DL + RSX] | 21015.7472 | 662.2326 | -20944.2472 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 93.5973 | 32.3222 | 42.9737 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1030.8697 | 110.2382 | -112.8702 | 199.3765 | 545.8113 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2602.3239 | 1154.9591 | -198.8078 | 380.5461 | 986.807 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 452.2312 | 36.0799 | -30.5342 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 789.0708 | 146.8812 | 340.3055 | 169.9786 | 473.109 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 514.9099 | 142.4001 | 213.6197 | 185.5338 | 546.4034 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 63.6116 | 8.1491 | -233.1672 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 443.1067 | 30.7828 | 30.4295 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2575.663 | 1203.7331 | -207.0778 | 379.4895 | 985.7504 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 861.3656 | 29.0083 | 111.1555 | 172.8436 | 475.9741 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 83.1806 | 31.6935 | 43.4646 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 752.6056 | 161.1216 | -334.8115 | 168.5334 | 471.6639 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 440.4627 | 160.4542 | 206.4076 | 182.5834 | 543.453 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 60.5286 | 7.5644 | 226.0129 | 18.5891 | 76.3282 |
| Top | Leg 15 | 753.52 | 206] [0.9 DL + 1.5 RSX] | 918.3124 | 154.3747 | -631.9299 | 175.1005 | 631.9299 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -26.9104 | 10.3307 | 33.5491 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1116.0277 | 230.3659 | -101.7034 | 202.7514 | 549.1862 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2787.9091 | 1111.0326 | -208.9791 | 387.901 | 994.1618 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 460.9267 | 30.6588 | 28.7425 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 896.683 | 151.0867 | 327.4506 | 174.2433 | 477.3737 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 430.3356 | 418.7158 | 215.754 | 182.1821 | 543.0516 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 142.984 | 8.8711 | -221.8528 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 453.1071 | 32.0724 | -28.7063 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2762.7228 | 1116.8607 | -211.5378 | 386.9028 | 993.1637 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1077.2138 | 73.2247 | 110.5065 | 181.3978 | 484.5283 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -33.1813 | 9.7594 | 34.518 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 856.8211 | 145.4184 | -322.5251 | 172.6635 | 475.794 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 379.7892 | 403.0866 | 207.9117 | 180.1789 | 541.0485 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 131.0381 | 7.1557 | 216.4632 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 820.35 | 206] [0.9 DL + 1.5 RSX] | 978.7896 | 149.8003 | -674.8428 | 177.4972 | 674.8428 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 693.4458 | -9.2316 | 10.4 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 693.4458 | 32.3222 | 14.73 | 5 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2635.2821 | -198.6275 | 6.52 | 5 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2635.2821 | 283.2442 | 6.97 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3478.4946 | -992.9554 | 5.83 | 5 |
| Top–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3478.4946 | 1154.9591 | 6.11 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 729.0096 | -30.74 | 6 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 952.3044 | 3.6549 | 6.12 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2276.1615 | -166.6402 | 6.55 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2276.1615 | 146.8812 | 6.42 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3388.6984 | -367.2757 | 8.54 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3388.6984 | 142.4001 | 7.46 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 476.3867 | -9.4371 | 7.72 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 476.3867 | 10.2399 | 7.87 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 945.1944 | -0.7884 | 5.94 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 725.4756 | 30.7828 | 5.98 | 5 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3484.5791 | -974.0457 | 5.8 | 5 |
| Top–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3484.5791 | 1203.7331 | 6.2 | 5 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2339.955 | -188.6767 | 6.85 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2339.955 | 137.105 | 6.5 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 680.9835 | -8.8189 | 10.17 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 680.9835 | 31.6935 | 14.45 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2255.0032 | -153.1489 | 6.41 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2255.0032 | 161.1216 | 6.47 | 5 |
| Top–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3324.0262 | -347.9811 | 8.32 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3324.0262 | 160.4542 | 7.42 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 477.718 | -10.4019 | 7.92 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 477.718 | 9.364 | 7.73 | 5 |
| Top–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1748.136 | -0.2235 | 4.16 | 5 |
| Top–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1545.754 | 153.8235 | 4.73 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 522.6163 | -31.6502 | 12.47 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 522.6163 | 10.3307 | 8.47 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2749.2325 | -276.2034 | 7.17 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2749.2325 | 230.3659 | 6.93 | 5 |
| Bottom–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3734.6575 | -982.9584 | 6.12 | 5 |
| Botttom–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3734.6575 | 1111.0326 | 6.34 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 959.9904 | -2.0452 | 6.1 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 959.9904 | 0.0459 | 6 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2380.2611 | -150.1789 | 6.69 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2380.2611 | 151.0867 | 6.7 | 5 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3231.2036 | -103.7139 | 6.96 | 5 |
| Botttom–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3231.2036 | 418.7158 | 8.47 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 588.3249 | -8.8636 | 9.02 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 588.3249 | 10.7859 | 9.38 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 954.1221 | -1.4712 | 6.03 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 954.1221 | 2.3861 | 6.08 | 5 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3700.7104 | -985.1897 | 6.08 | 5 |
| Botttom–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3700.7104 | 1116.8607 | 6.31 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2444.8005 | -158.9702 | 6.9 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2444.8005 | 190.9425 | 7.12 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 516.2353 | -31.081 | 12.28 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 516.2353 | 9.7594 | 8.28 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2356.1853 | -156.16 | 6.67 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2356.1853 | 145.4184 | 6.6 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3202.3171 | -127.1128 | 7.01 | 5 |
| Botttom–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3202.3171 | 403.0866 | 8.34 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 572.741 | -10.5653 | 9.14 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 572.741 | 9.2755 | 8.9 | 5 |
| Bottom–Left | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1865.1736 | -0.6687 | 4.45 | 5 |
| Botttom–Right | Leg 15 | 0 | 203] 1.5 [DL + RSY] | 1645.8497 | 148.269 | 4.93 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 15F(+48.65) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.36 | 203] 1.5 [DL + RSY] | 24645.2108 | -8589.9383 | -239.8149 |
| Bottom | 0.367 | 203] 1.5 [DL + RSY] | 25292.3447 | -8285.2249 | -246.7587 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 113.964 | 32.389 | 43.8146 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1187.6971 | 111.3578 | -117.7544 | 205.5917 | 552.0265 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2790.5426 | 1125.2187 | -214.1175 | 388.0053 | 994.2662 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 496.4246 | 37.3432 | -31.6499 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 902.2583 | 147.8547 | 360.018 | 174.4642 | 477.5947 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 654.0064 | 156.9557 | 222.1091 | 191.0463 | 551.9159 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 82.8411 | 8.6041 | -231.3676 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 486.3023 | 32.1139 | 31.5674 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2760.9892 | 1173.1101 | -222.3517 | 386.8341 | 993.095 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 995.7837 | 30.7842 | 115.9477 | 178.1707 | 481.3012 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 103.1574 | 31.7436 | 44.2945 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 863.0827 | 161.8441 | -355.3494 | 172.9117 | 476.0421 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 576.5789 | 172.5569 | 215.5012 | 187.9778 | 548.8474 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 78.5559 | 7.8439 | 225.0811 | 18.5891 | 76.3282 |
| Top | Leg 15 | 828.41 | 206] [0.9 DL + 1.5 RSX] | 983.8175 | 156.8396 | -679.9277 | 177.6965 | 679.9277 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -11.4716 | 11.5365 | 34.0468 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1414.9657 | 39.9943 | -105.8518 | 214.5985 | 561.0333 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2967.6105 | 1091.319 | -221.4182 | 395.0226 | 1001.2835 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 504.5147 | 32.0015 | 30.0607 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1009.4551 | 150.7454 | 347.123 | 178.7125 | 481.843 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 562.6975 | 418.4036 | 224.2208 | 187.4277 | 548.2972 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 164.6052 | 9.1565 | -219.0959 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 495.7791 | 33.0663 | -29.9654 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2941.6709 | 1101.7098 | -223.994 | 393.9946 | 1000.2555 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1199.3083 | 73.6383 | 116.3461 | 186.2365 | 489.367 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -18.2813 | 10.9359 | 35.0346 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 966.7931 | 146.4837 | -343.0213 | 177.0218 | 480.1522 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 505.8874 | 404.0894 | 216.9584 | 185.1762 | 546.0458 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 152.8352 | 7.4655 | 214.5013 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 903.38 | 206] [0.9 DL + 1.5 RSX] | 1043.2086 | 154.7318 | -727.7349 | 180.0502 | 727.7349 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 707.759 | -10.4618 | 10.81 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 707.759 | 32.389 | 14.92 | 5 |
| Top–Left | Leg 2 | 300 | 202] 1.5 [DL + RSX] | 2764.0378 | -201.9734 | 6.81 | 5 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2764.0378 | 285.8927 | 7.25 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3731.9958 | -970.9166 | 6.09 | 5 |
| Top–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3731.9958 | 1125.2187 | 6.36 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 772.9122 | -32.1455 | 6.34 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 992.4924 | 3.5859 | 6.37 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2385.3333 | -167.7106 | 6.82 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2385.3333 | 147.8547 | 6.69 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3506.4132 | -364.9501 | 8.76 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3506.4132 | 156.9557 | 7.77 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 507.4913 | -9.8075 | 8.18 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 507.4913 | 10.7924 | 8.37 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 985.2636 | -0.7684 | 6.19 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 769.4108 | 32.1139 | 6.31 | 5 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3737.4165 | -948.5653 | 6.06 | 5 |
| Top–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3953.3182 | 201.7579 | 5.05 | 5 |
| Top–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2449.2909 | -190.7901 | 7.13 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2449.2909 | 139.6568 | 6.78 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 694.8117 | -10.0268 | 10.57 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 694.8117 | 31.7436 | 14.64 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2362.1124 | -154.4464 | 6.67 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2362.1124 | 161.8441 | 6.73 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3439.9565 | -347.2251 | 8.55 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3439.9565 | 172.5569 | 7.71 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 507.7335 | -10.948 | 8.4 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 507.7335 | 9.7324 | 8.17 | 5 |
| Top–Left | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1655.0217 | -159.3725 | 5.02 | 5 |
| Top–Right | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1655.0217 | 156.2064 | 5 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 558.2098 | -31.5776 | 12.9 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 558.2098 | 11.5365 | 9.14 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2863.395 | -271.129 | 7.38 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2863.395 | 228.3826 | 7.15 | 5 |
| Bottom–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3988.0777 | -966.8755 | 6.39 | 5 |
| Botttom–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4160.7499 | 121.3001 | 5.16 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1005.8442 | -1.9401 | 6.38 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1005.8442 | 0.3028 | 6.3 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2486.2825 | -151.6112 | 6.95 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2486.2825 | 150.7454 | 6.95 | 5 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3379.6709 | -119.6698 | 7.33 | 5 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3379.6709 | 418.4036 | 8.77 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 600.7542 | -9.2744 | 9.25 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 600.7542 | 11.1512 | 9.6 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 999.9469 | -1.6769 | 6.33 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 999.9469 | 2.2826 | 6.36 | 5 |
| Bottom–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3951.9454 | -971.9702 | 6.36 | 5 |
| Botttom–Right | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4147.836 | 134.3724 | 5.17 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2541.5701 | -157.1875 | 7.12 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2541.5701 | 187.3378 | 7.33 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 550.5759 | -30.9991 | 12.69 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 550.5759 | 10.9359 | 8.93 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2460.7238 | -156.3845 | 6.92 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2460.7238 | 146.4837 | 6.86 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3346.4934 | -141.0815 | 7.37 | 5 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3346.4934 | 404.0894 | 8.63 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 585.473 | -10.9425 | 9.37 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 585.473 | 9.6525 | 9.13 | 5 |
| Bottom–Left | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1753.3138 | -161.188 | 5.27 | 5 |
| Botttom–Right | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1753.3138 | 153.1178 | 5.22 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 14F(+45.5) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.38 | 203] 1.5 [DL + RSY] | 26287.554 | -8353.596 | -268.658 |
| Bottom | 0.389 | 203] 1.5 [DL + RSY] | 26934.6879 | -8492.0341 | -281.3764 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 137.7704 | 32.3275 | 44.5425 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1344.8986 | 111.8673 | -121.0578 | 211.8217 | 558.2565 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 2970.4682 | 1104.6962 | -222.9827 | 395.1359 | 1001.3968 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 539.2365 | 38.3368 | -32.5873 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1014.8784 | 147.2294 | 383.5554 | 178.9275 | 482.0579 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 799.2425 | 171.2942 | 231.7947 | 196.8021 | 557.6716 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 100.3284 | 9.0069 | -228.936 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 528.0988 | 33.2016 | 32.5341 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 2938.556 | 1151.2963 | -231.2521 | 393.8712 | 1000.1321 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1130.2618 | 32.4743 | 119.0667 | 183.5002 | 486.6306 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 126.6315 | 31.6639 | 45.0149 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 973.033 | 161.3878 | -379.6577 | 177.2691 | 480.3995 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 718.8699 | 184.395 | 225.8006 | 193.6169 | 554.4864 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 94.9958 | 8.0617 | 223.438 | 18.5891 | 76.3282 |
| Top | Leg 15 | 912.49 | 206] [0.9 DL + 1.5 RSX] | 1048.1011 | 157.6045 | -733.4503 | 180.2441 | 733.4503 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 1.4696 | 12.6737 | 34.4645 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1541.963 | 43.6036 | -108.9148 | 219.6315 | 566.0662 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3138.9987 | 1093.8618 | -226.9525 | 401.8149 | 1008.0757 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 546.4828 | 33.228 | 31.1763 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1117.0587 | 151.798 | 371.6157 | 182.9769 | 486.1074 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 684.3291 | 417.6566 | 233.6766 | 192.248 | 553.1176 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 186.9478 | 9.3904 | -215.6435 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 536.8554 | 33.9914 | -31.0092 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3112.8753 | 1110.0743 | -229.7441 | 400.7796 | 1007.0404 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1307.7864 | 73.8826 | 120.618 | 190.5356 | 493.666 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -5.7938 | 12.0478 | 35.4697 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1071.5012 | 148.9861 | -368.2864 | 181.1715 | 484.3019 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 621.5689 | 404.4738 | 227.003 | 189.7608 | 550.6303 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 175.3292 | 7.7389 | 211.7745 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 993.51 | 206] [0.9 DL + 1.5 RSX] | 1106.5064 | 163.1869 | -784.8844 | 182.5587 | 784.8844 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 717.5518 | -11.6777 | 11.16 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 717.5518 | 32.3275 | 15.03 | 5 |
| Top–Left | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 2804.4916 | -29.0065 | 5.99 | 5 |
| Top–Right | Leg 2 | 400 | 203] 1.5 [DL + RSY] | 2890.7457 | 286.7197 | 7.52 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3985.0537 | -955.8021 | 6.37 | 5 |
| Top–Right | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4160.6174 | 130.587 | 5.18 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 816.1131 | -33.3186 | 6.66 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1035.6604 | 3.4604 | 6.64 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2491.1246 | -167.6102 | 7.07 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2491.1246 | 147.2294 | 6.93 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3612.3765 | -360.6695 | 8.96 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3612.3765 | 171.2942 | 8.05 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 539.7269 | -10.1033 | 8.64 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 539.7269 | 11.2788 | 8.86 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1028.7711 | -0.78 | 6.47 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 812.9642 | 33.2016 | 6.64 | 5 |
| Top–Left | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3989.8543 | -930.3851 | 6.33 | 5 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 3989.8543 | 1151.2963 | 6.71 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2556.2365 | -191.7684 | 7.39 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2556.2365 | 141.4902 | 7.05 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 704.2372 | -11.2249 | 10.91 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 704.2372 | 31.6639 | 14.74 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2466.2048 | -154.1112 | 6.92 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2466.2048 | 161.3878 | 6.97 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3544.9282 | -344.5341 | 8.74 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3544.9282 | 184.395 | 7.97 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 539.1296 | -11.4296 | 8.88 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 539.1296 | 10.0251 | 8.62 | 5 |
| Top–Left | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1762.4274 | -160.4422 | 5.29 | 5 |
| Top–Right | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1762.4274 | 156.8951 | 5.26 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 596.6537 | -31.3521 | 13.34 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 596.6537 | 12.6737 | 9.83 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2976.1063 | -264.0337 | 7.58 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 2976.1063 | 224.5409 | 7.37 | 5 |
| Bottom–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4241.9143 | -971.32 | 6.7 | 5 |
| Botttom–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4241.9143 | 1093.8618 | 6.91 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1058.6323 | -1.8268 | 6.7 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1058.6323 | 0.5122 | 6.64 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2592.5712 | -154.4238 | 7.22 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2592.5712 | 151.798 | 7.21 | 5 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3533.2907 | -134.649 | 7.71 | 5 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3533.2907 | 417.6566 | 9.07 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 610.2824 | -9.638 | 9.44 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 610.2824 | 11.4529 | 9.78 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1052.9821 | -1.8509 | 6.67 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1052.9821 | 2.2045 | 6.68 | 5 |
| Bottom–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4203.3986 | -981.7485 | 6.67 | 5 |
| Botttom–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4203.3986 | 1110.0743 | 6.89 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2637.2974 | -153.7459 | 7.33 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2637.2974 | 181.9301 | 7.52 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 587.8373 | -30.7648 | 13.12 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 587.8373 | 12.0478 | 9.61 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2566.0033 | -157.9985 | 7.18 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2566.0033 | 148.9861 | 7.12 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3496.7365 | -154.2376 | 7.73 | 5 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3496.7365 | 404.4738 | 8.93 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 595.4555 | -11.2485 | 9.55 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 595.4555 | 9.9828 | 9.31 | 5 |
| Bottom–Left | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1859.0495 | -169.9794 | 5.58 | 5 |
| Botttom–Right | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1859.0495 | 161.4887 | 5.52 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 13F(+42.35) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.401 | 203] 1.5 [DL + RSY] | 27917.9815 | -8244.8276 | -295.5086 |
| Bottom | 0.412 | 203] 1.5 [DL + RSY] | 28565.1154 | -8928.4158 | -311.9969 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 165.1234 | 32.0591 | 45.2298 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1495.5522 | 111.4471 | -121.7765 | 217.7922 | 564.227 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3142.2578 | 1105.5256 | -224.3068 | 401.944 | 1008.2049 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 580.0684 | 38.8466 | -33.1893 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1121.9767 | 144.6957 | 410.9976 | 183.1718 | 486.3023 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 942.9563 | 185.5122 | 241.494 | 202.4976 | 563.3671 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 115.0041 | 9.2892 | -225.6169 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 567.9592 | 33.9276 | 33.1748 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3108.617 | 1150.1863 | -233.1226 | 400.6108 | 1006.8717 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1258.9284 | 33.8034 | 119.6474 | 188.5993 | 491.7297 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 153.6591 | 31.3748 | 45.6956 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1077.4178 | 159.6147 | -407.8371 | 181.4059 | 484.5364 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 859.4785 | 196.1356 | 236.0608 | 199.1893 | 560.0588 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 108.7596 | 8.1961 | 220.8379 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1002.79 | 206] [0.9 DL + 1.5 RSX] | 1111.2825 | 156.4995 | -790.7011 | 182.748 | 790.7011 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 8.5611 | 13.7192 | 34.8487 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1650.1339 | 48.5706 | -109.7559 | 223.9183 | 570.3531 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3305.1583 | 1124.1262 | -224.6756 | 408.3999 | 1014.6607 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 586.4097 | 34.3355 | 31.9647 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1212.9162 | 157.9961 | 400.0879 | 186.7758 | 489.9063 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 780.1911 | 413.7803 | 243.1735 | 196.0471 | 556.9166 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 208.7311 | -7.7982 | -211.5115 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 576.0176 | 34.8373 | -31.7023 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3279.5336 | 1146.1668 | -227.9395 | 407.3843 | 1013.6452 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1400.2876 | 73.1583 | 122.7402 | 194.2015 | 497.3319 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 0.9856 | 13.0703 | 35.8522 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1164.168 | 153.767 | -397.6161 | 184.8439 | 487.9743 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 711.8066 | 401.4045 | 237.017 | 193.3369 | 554.2065 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 197.2494 | 8.0362 | 208.3222 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1074.91 | 206] [0.9 DL + 1.5 RSX] | 1169.3955 | 174.7357 | -836.7294 | 185.0511 | 836.7294 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 722.6607 | -12.845 | 11.44 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 722.6607 | 32.0591 | 15.04 | 5 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3020.3327 | -204.561 | 7.36 | 5 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3020.3327 | 285.9908 | 7.78 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4238.6886 | -960.1806 | 6.68 | 5 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4238.6886 | 1105.5256 | 6.93 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 859.5318 | -34.1446 | 6.97 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1085.7269 | 3.249 | 6.94 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2597.4377 | -166.2045 | 7.32 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2597.4377 | 144.6957 | 7.17 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3712.8304 | -354.3884 | 9.13 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3712.8304 | 185.5122 | 8.32 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 574.0033 | -10.2949 | 9.11 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 574.0033 | 11.6167 | 9.35 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1079.5481 | -0.77 | 6.78 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 857.0437 | 33.9276 | 6.95 | 5 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4242.5303 | -932.3744 | 6.64 | 5 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4242.5303 | 1150.1863 | 7.01 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2665.1841 | -192.033 | 7.65 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2665.1841 | 142.9323 | 7.32 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 709.1342 | -12.3815 | 11.19 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 709.1342 | 31.3748 | 14.75 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2571.2199 | -151.82 | 7.15 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2571.2199 | 159.6147 | 7.21 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3645.3334 | -339.8013 | 8.92 | 5 |
| Top–Right | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3645.3334 | 196.1356 | 8.23 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 572.7614 | -11.766 | 9.37 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 572.7614 | 10.2122 | 9.07 | 5 |
| Top–Left | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1868.1913 | -159.6316 | 5.53 | 5 |
| Top–Right | Leg 15 | 200 | 202] 1.5 [DL + RSX] | 1868.1913 | 155.7164 | 5.51 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 639.8903 | -30.925 | 13.8 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 639.8903 | 13.7192 | 10.57 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3095.0793 | -258.0525 | 7.79 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3095.0793 | 223.852 | 7.61 | 5 |
| Bottom–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4498.7482 | -1001.5973 | 7.06 | 5 |
| Botttom–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4498.7482 | 1124.1262 | 7.27 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1120.3773 | -1.6813 | 7.08 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1120.3773 | 0.6632 | 7.03 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2703.8818 | -159.4976 | 7.52 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2703.8818 | 157.9961 | 7.51 | 5 |
| Bottom–Left | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3701.1379 | -148.5587 | 8.12 | 5 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3701.1379 | 413.7803 | 9.39 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 618.401 | -10.0155 | 9.61 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 618.401 | 11.6214 | 9.91 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1115.1389 | -1.9686 | 7.06 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1115.1389 | 2.128 | 7.07 | 5 |
| Bottom–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4457.3911 | -1019.1689 | 7.04 | 5 |
| Botttom–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4457.3911 | 1146.1668 | 7.26 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2739.8098 | -151.7273 | 7.56 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2739.8098 | 176.1415 | 7.72 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 629.8904 | -30.3304 | 13.56 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 629.8904 | 13.0703 | 10.32 | 5 |
| Bottom–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2676.5259 | -164.8378 | 7.49 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2676.5259 | 153.767 | 7.42 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3662.1867 | -166.7442 | 8.12 | 5 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3662.1867 | 401.4045 | 9.25 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 604.238 | -11.4108 | 9.69 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 604.238 | 10.3334 | 9.49 | 5 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2181.8646 | -1.2888 | 5.2 | 5 |
| Botttom–Right | Leg 15 | 200 | 203] 1.5 [DL + RSY] | 1964.0316 | 172.9527 | 5.85 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 12F(+39.2) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.414 | 203] 1.5 [DL + RSY] | 29533.3062 | -8329.9066 | -319.5194 |
| Bottom | 0.428 | 203] 1.5 [DL + RSY] | 30180.4401 | -9572.7879 | -336.8855 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 194.3958 | 31.47 | 45.9058 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1635.9103 | 110.5844 | -119.5266 | 234.8459 | 581.2807 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3309.0744 | 1134.4584 | -217.4368 | 429.5746 | 1035.8355 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 618.6517 | 38.5996 | -33.3294 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1216.8944 | 142.2213 | 436.9728 | 196.5509 | 499.6814 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1068.9178 | 199.4523 | 247.8846 | 218.1645 | 579.0341 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 125.892 | 9.2827 | -220.7658 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 605.7476 | 34.083 | 33.3741 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3274.6222 | 1176.1303 | -227.3936 | 428.139 | 1034.3999 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1378.8096 | 33.8084 | 117.4484 | 203.2979 | 506.4283 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 182.49 | 30.76 | 46.3833 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1169.3419 | 155.8763 | -434.7271 | 194.5694 | 497.6999 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 982.0731 | 207.4346 | 242.4932 | 214.5457 | 575.4153 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 118.8653 | 8.2875 | 216.5882 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1066.28 | 206] [0.9 DL + 1.5 RSX] | 1174.1452 | 153.5549 | -841.2135 | 194.7696 | 841.2135 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 4.1076 | 14.6814 | 35.6268 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1742.8716 | 55.4724 | -109.7914 | 239.303 | 585.7377 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3467.4303 | 1175.8703 | -213.1169 | 436.1733 | 1042.4341 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 623.6152 | 35.7528 | 32.3992 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1293.9592 | 172.3676 | 421.8104 | 199.7622 | 502.8926 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 834.6789 | 404.9837 | 249.6566 | 208.4039 | 569.2735 |
| Bottom | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 229.0047 | -8.0749 | -205.9211 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 612.5523 | 35.969 | -31.986 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3443.6745 | 1203.5308 | -216.5669 | 435.1834 | 1041.4442 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1479.6997 | 71.1682 | 124.4082 | 207.5019 | 510.6324 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -3.4545 | 14.0121 | 36.6202 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1241.5767 | 161.1866 | -420.4387 | 197.5794 | 500.7099 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 760.0512 | 392.4976 | 243.6549 | 205.2942 | 566.1638 |
| Bottom | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 218.2097 | 8.2747 | 203.2802 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1102.43 | 206] [0.9 DL + 1.5 RSX] | 1232.3393 | 185.9309 | -865.5554 | 197.1945 | 865.5554 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 723.1321 | -13.8753 | 11.64 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 723.1321 | 31.47 | 14.94 | 5 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3160.784 | -206.968 | 7.66 | 5 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3160.784 | 288.3463 | 8.09 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4495.6374 | -990.5548 | 7.04 | 5 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4495.6374 | 1134.4584 | 7.28 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 904.2189 | -34.4218 | 7.26 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1144.9559 | 2.9334 | 7.29 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2709.0518 | -162.9175 | 7.56 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2709.0518 | 142.2213 | 7.42 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3817.6783 | -348.5317 | 9.31 | 5 |
| Top–Right | Leg 6 | 400 | 202] 1.5 [DL + RSX] | 3817.6783 | 199.4523 | 8.59 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 611.4549 | -10.4131 | 9.6 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 611.4549 | 11.609 | 9.82 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1139.6907 | -0.6699 | 7.15 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 902.7154 | 34.083 | 7.24 | 5 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4497.7822 | -961.2717 | 6.99 | 5 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4497.7822 | 1176.1303 | 7.35 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2784.0814 | -195.203 | 7.96 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2784.0814 | 146.0522 | 7.62 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 709.6984 | -13.4053 | 11.38 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 709.6984 | 30.76 | 14.64 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2681.6565 | -149.5905 | 7.4 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2681.6565 | 155.8763 | 7.45 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3751.3043 | -335.6697 | 9.11 | 5 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3751.3043 | 207.4346 | 8.5 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 609.864 | -11.7454 | 9.83 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 609.864 | 10.3291 | 9.56 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2172.7072 | -0.2722 | 5.17 | 5 |
| Top–Right | Leg 15 | 200 | 203] 1.5 [DL + RSY] | 1973.302 | 152.7011 | 5.74 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 691.37 | -30.1501 | 14.3 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 691.37 | 14.6814 | 11.39 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3228.3512 | -260.6854 | 8.08 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3228.3512 | 234.9591 | 7.95 | 5 |
| Bottom–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4760.4017 | -1051.6468 | 7.46 | 5 |
| Botttom–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4825.1566 | 115.8793 | 5.94 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1189.8569 | -1.4926 | 7.51 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1189.8569 | 0.8675 | 7.48 | 5 |
| Bottom–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2825.8576 | -167.533 | 7.87 | 5 |
| Botttom–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2825.8576 | 172.3676 | 7.9 | 5 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3890.5195 | -162.8086 | 8.56 | 5 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3890.5195 | 404.9837 | 9.72 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 628.4083 | -10.3476 | 9.8 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 628.4083 | 11.7336 | 10.06 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1184.9822 | -2.0837 | 7.5 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1184.9822 | 2.0864 | 7.5 | 5 |
| Bottom–Left | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 4810.087 | -30.5702 | 5.78 | 5 |
| Botttom–Right | Leg 9 | 600 | 202] 1.5 [DL + RSX] | 4810.087 | 158.0479 | 6 | 5 |
| Bottom–Left | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2857.3706 | -156.0652 | 7.86 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2857.3706 | 174.5503 | 7.99 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 680.3752 | -29.539 | 14.04 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 680.3752 | 14.0121 | 11.13 | 5 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 2797.2985 | -180.2823 | 7.89 | 5 |
| Botttom–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2797.2985 | 161.1866 | 7.76 | 5 |
| Bottom–Left | Leg 13 | 400 | 202] 1.5 [DL + RSX] | 3849.7389 | -182.2255 | 8.57 | 5 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3849.7389 | 392.4976 | 9.58 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 615.9188 | -11.4937 | 9.85 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 615.9188 | 10.6183 | 9.69 | 5 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2286.0581 | -1.4852 | 5.45 | 5 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2068.4778 | 184.0969 | 6.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 11F(+36.05) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.436 | 203] 1.5 [DL + RSY] | 31129.8108 | -8620.8758 | -339.1166 |
| Bottom | 0.451 | 203] 1.5 [DL + RSY] | 31776.9447 | -10272.5588 | -358.1171 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 223.2979 | 30.8109 | 45.0948 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1766.4324 | 109.7353 | -121.0739 | 240.2847 | 586.7195 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3471.2486 | 1186.6276 | -200.1862 | 436.3324 | 1042.5932 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 654.1345 | 36.9247 | -32.3389 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1296.9148 | 144.7531 | 442.5411 | 199.8854 | 503.0158 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1158.2149 | 211.1007 | 245.3949 | 221.8855 | 582.7551 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 135.5233 | 9.0144 | -215.083 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 640.4699 | 32.6813 | 32.3918 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3437.7162 | 1225.2102 | -210.3207 | 434.9351 | 1041.196 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1490.2293 | 31.9194 | 117.1678 | 207.9407 | 511.0711 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 210.8898 | 30.0528 | 45.6783 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1245.9764 | 149.5805 | -441.329 | 197.7628 | 500.8932 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1066.8466 | 213.6482 | 242.2202 | 218.0782 | 578.9478 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 128.6004 | 7.8705 | 211.7226 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1104.13 | 206] [0.9 DL + 1.5 RSX] | 1237.035 | 149.7379 | -866.7793 | 197.3902 | 866.7793 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -6.2983 | 16.2756 | 36.2415 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1674.9544 | 255.3174 | -107.6151 | 236.4729 | 582.9077 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3613.9799 | 1227.441 | -189.59 | 437.5304 | 1043.7913 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 655.045 | 37.2881 | 32.0431 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1363.7621 | 185.5709 | 407.1066 | 202.6708 | 505.8013 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 874.7553 | 381.892 | 246.0533 | 210.0739 | 570.9434 |
| Bottom | Leg 7 | OS | 206] [0.9 DL + 1.5 RSX] | 54.8365 | -10.5067 | -209.2844 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 642.5417 | 36.255 | -31.5197 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3593.2633 | 1262.4517 | -192.5276 | 437.5304 | 1043.7913 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1555.2892 | 66.0528 | 113.5845 | 210.6517 | 513.7821 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -15.3457 | 15.574 | 37.423 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1311.1982 | 176.3986 | 403.6928 | 200.4805 | 503.611 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 788.1603 | 374.4636 | 242.2678 | 206.4655 | 567.335 |
| Bottom | Leg 14 | OS | 206] [0.9 DL + 1.5 RSX] | 47.1954 | 10.809 | 208.5631 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1086.03 | 206] [0.9 DL + 1.5 RSX] | 1292.7013 | 194.9292 | -858.1262 | 199.7098 | 858.1262 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 719.7881 | -14.6304 | 11.74 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 719.7881 | 30.8109 | 14.77 | 5 |
| Top–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3317.2874 | -219.6821 | 8.06 | 5 |
| Top–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3317.2874 | 304.1475 | 8.5 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4757.0792 | -1042.7319 | 7.44 | 5 |
| Top–Right | Leg 3 | 600 | 203] 1.5 [DL + RSY] | 4827.5884 | 129.5219 | 5.97 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 950.7663 | -33.1282 | 7.5 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1211.9194 | 2.7089 | 7.7 | 5 |
| Top–Left | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2831.7162 | -157.4447 | 7.81 | 5 |
| Top–Right | Leg 5 | 300 | 202] 1.5 [DL + RSX] | 2831.7162 | 144.7531 | 7.73 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3938.1973 | -342.823 | 9.52 | 5 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 3938.1973 | 211.1007 | 8.89 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 651.8395 | -9.9359 | 10.01 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 651.8395 | 11.2561 | 10.26 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1207.4336 | -0.7464 | 7.58 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 950.5546 | 32.6813 | 7.47 | 5 |
| Top–Left | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4756.9696 | -1011.9094 | 7.38 | 5 |
| Top–Right | Leg 9 | 600 | 203] 1.5 [DL + RSY] | 4842.929 | 158.8259 | 6.04 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2919.5758 | -208.5371 | 8.37 | 5 |
| Top–Right | Leg 10 | 300 | 202] 1.5 [DL + RSX] | 2919.5758 | 157.2919 | 8.02 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 707.0977 | -14.2026 | 11.5 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 707.0977 | 30.0528 | 14.47 | 5 |
| Top–Left | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2802.7426 | -152.6384 | 7.71 | 5 |
| Top–Right | Leg 12 | 300 | 202] 1.5 [DL + RSX] | 2802.7426 | 149.5805 | 7.69 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3873.5976 | -332.5197 | 9.34 | 5 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 3873.5976 | 213.6482 | 8.77 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 650.6645 | -11.4686 | 10.28 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 650.6645 | 9.8481 | 9.98 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2277.3707 | -0.3107 | 5.42 | 5 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2077.665 | 148.841 | 5.96 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 753.7845 | -29.8986 | 15.03 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 753.7845 | 16.2756 | 12.47 | 5 |
| Bottom–Left | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3369.3348 | -276.0416 | 8.46 | 5 |
| Botttom–Right | Leg 2 | 400 | 202] 1.5 [DL + RSX] | 3369.3348 | 255.3174 | 8.35 | 5 |
| Bottom–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5013.3877 | -1102.5622 | 7.84 | 5 |
| Botttom–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5013.3877 | 1227.441 | 8.06 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1258.2916 | -0.6963 | 7.9 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1258.2916 | 1.2645 | 7.92 | 5 |
| Bottom–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 2962.0798 | -184.0962 | 8.3 | 5 |
| Botttom–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 2962.0798 | 185.5709 | 8.31 | 5 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4111.4227 | -169.4423 | 9.04 | 5 |
| Botttom–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4111.4227 | 381.892 | 10.06 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 635.0709 | -10.2644 | 9.86 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 635.0709 | 11.4763 | 10.09 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1252.7592 | -2.2086 | 7.93 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1252.7592 | 0.9691 | 7.88 | 5 |
| Bottom–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 4967.5612 | -1127.5372 | 7.83 | 5 |
| Botttom–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 4967.5612 | 1262.4517 | 8.06 | 5 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2983.9161 | -167.1876 | 8.24 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 2983.9161 | 181.3173 | 8.34 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 741.1202 | -29.3858 | 14.77 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 741.1202 | 15.574 | 12.18 | 5 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 2933.6825 | -192.4489 | 8.29 | 5 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 2933.6825 | 176.3986 | 8.18 | 5 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4069.6424 | -190.9028 | 9.06 | 5 |
| Botttom–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4069.6424 | 374.4636 | 9.94 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 624.9061 | -11.0442 | 9.88 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 624.9061 | 10.7502 | 9.83 | 5 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2387.1923 | -1.5226 | 5.69 | 5 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2169.0805 | 193.1231 | 6.48 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 10F(+32.9) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.458 | 203] 1.5 [DL + RSY] | 32729.9723 | -8963.105 | -356.7854 |
| Bottom | 0.473 | 203] 1.5 [DL + RSY] | 33377.1062 | -10570.2189 | -362.8365 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 252.4684 | 30.8366 | 40.4025 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1892.5519 | 115.1582 | -99.4017 | 245.5401 | 591.9749 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3617.492 | 1242.1347 | -171.8904 | 437.5304 | 1043.7913 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 684.3617 | 35.8611 | -31.2702 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1367.3748 | 147.7494 | 401.0256 | 202.8214 | 505.9518 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1221.0562 | 212.9585 | 222.743 | 224.5041 | 585.3736 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 150.576 | -7.5934 | -202.8603 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 668.9715 | 31.031 | 31.6785 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3586.1309 | 1280.565 | -179.9081 | 437.5304 | 1043.7913 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1599.4797 | 40.4425 | 94.4062 | 212.4931 | 515.6235 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 239.5085 | 30.1571 | 41.1146 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1313.25 | 149.3651 | -396.6054 | 200.566 | 503.6965 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1128.7391 | 213.6705 | 223.7553 | 220.6573 | 581.5268 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 140.3392 | 7.3404 | 200.3682 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1082.45 | 206] [0.9 DL + 1.5 RSX] | 1297.0174 | 146.1699 | -856.1353 | 199.8896 | 856.1353 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 17.9498 | 15.6167 | 30.5638 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 1937.9893 | 54.9238 | -97.1106 | 247.4334 | 593.8682 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3741.9681 | 1268.4725 | -167.3013 | 437.5304 | 1043.7913 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 683.0084 | 33.0286 | 30.8193 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1409.1467 | 175.0581 | -380.1132 | 204.562 | 507.6924 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 950.7059 | 377.5065 | 223.5331 | 213.2387 | 574.1083 |
| Bottom | Leg 7 | OS | 206] [0.9 DL + 1.5 RSX] | 66.1543 | -9.5745 | -208.3924 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 668.2624 | 32.8449 | -30.0349 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3721.2147 | 1309.8941 | -169.7733 | 437.5304 | 1043.7913 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1653.4711 | 76.8679 | 112.1593 | 214.7429 | 517.8733 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 7.4289 | 15.0965 | 31.9359 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1357.785 | 185.8197 | 386.8687 | 202.4218 | 505.5522 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 863.0554 | 377.2709 | 224.0419 | 209.5863 | 570.4559 |
| Bottom | Leg 14 | OS | 206] [0.9 DL + 1.5 RSX] | 56.119 | 10.0548 | 208.16 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1065.82 | 206] [0.9 DL + 1.5 RSX] | 1348.8598 | 210.0027 | -848.2141 | 202.0499 | 848.2141 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 717.8624 | -16.0863 | 11.99 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 717.8624 | 30.8366 | 14.76 | 5 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3476.6677 | -250.0007 | 8.55 | 5 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3476.6677 | 329.8515 | 8.96 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5007.8176 | -1099.1524 | 7.83 | 5 |
| Top–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5007.8176 | 1242.1347 | 8.07 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 997.6033 | -31.8593 | 7.73 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1278.1274 | 2.803 | 8.12 | 5 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 2968.1133 | -158.3755 | 8.14 | 5 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 2968.1133 | 147.7494 | 8.07 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4100.6771 | -313.6628 | 9.71 | 5 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4100.6771 | 212.9585 | 9.22 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 682.4478 | -9.4625 | 10.3 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 682.4478 | 10.3951 | 10.48 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1273.2424 | -1.1027 | 8.01 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 997.9483 | 31.031 | 7.69 | 5 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5007.1064 | -1061.9344 | 7.77 | 5 |
| Top–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5007.1064 | 1280.565 | 8.14 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3061.5887 | -228.8755 | 8.85 | 5 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3061.5887 | 180.5508 | 8.52 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 706.5128 | -15.726 | 11.78 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 706.5128 | 30.1571 | 14.49 | 5 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 2939.9789 | -156.9201 | 8.07 | 5 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 2939.9789 | 149.3651 | 8.02 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4036.3731 | -308.772 | 9.55 | 5 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4036.3731 | 213.6705 | 9.1 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 682.6919 | -11.1832 | 10.63 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 682.6919 | 9.2289 | 10.26 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2378.3659 | -0.2807 | 5.66 | 5 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2177.8202 | 145.2626 | 6.17 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 771.0141 | -30.0705 | 15.28 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 771.0141 | 15.6167 | 12.57 | 5 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3523.6725 | -255.6188 | 8.67 | 5 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3523.6725 | 220.3773 | 8.49 | 5 |
| Bottom–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5244.726 | -1144.2577 | 8.19 | 5 |
| Botttom–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5244.726 | 1268.4725 | 8.4 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1314.396 | -0.7588 | 8.25 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1314.396 | 0.9519 | 8.26 | 5 |
| Bottom–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3111.8956 | -191.6116 | 8.71 | 5 |
| Botttom–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3111.8956 | 175.0581 | 8.6 | 5 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4320.051 | -157.3033 | 9.4 | 5 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4320.051 | 377.5065 | 10.45 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 653.3573 | -9.3285 | 9.92 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 653.3573 | 10.5588 | 10.15 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1306.7793 | -1.8712 | 8.26 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1306.7793 | 1.862 | 8.25 | 5 |
| Bottom–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5198.7975 | -1162.9986 | 8.17 | 5 |
| Botttom–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5198.7975 | 1309.8941 | 8.42 | 5 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3118.3912 | -143.314 | 8.4 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3118.3912 | 169.7473 | 8.58 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 757.2328 | -29.4488 | 14.99 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 757.2328 | 15.0965 | 12.3 | 5 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3087.8996 | -180.2725 | 8.58 | 5 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3087.8996 | 185.8197 | 8.62 | 5 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4279.1777 | -167.221 | 9.36 | 5 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4279.1777 | 377.2709 | 10.37 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 639.9166 | -10.2037 | 9.91 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 639.9166 | 10.0176 | 9.88 | 5 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2481.5284 | -1.4828 | 5.92 | 5 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2265.0694 | 208.2203 | 6.81 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 9F(+29.75) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.479 | 203] 1.5 [DL + RSY] | 34336.4099 | -9054.2205 | -362.2057 |
| Bottom | 0.496 | 203] 1.5 [DL + RSY] | 34983.5438 | -11046.5195 | -354.2974 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 289.0034 | 30.8524 | 42.7371 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2017.4074 | 105.366 | -101.7107 | 250.0174 | 596.4522 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3746.2656 | 1286.4852 | -165.4625 | 437.5304 | 1043.7913 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 709.2386 | 33.874 | -30.4819 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1412.0648 | 134.7909 | 414.8074 | 204.6836 | 507.814 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1322.032 | 214.4023 | 230.8289 | 228.7117 | 589.5812 |
| Top | Leg 7 | OS | 204] 1.2 [DL + LL + RSX] | 150.5181 | 8.1996 | -202.6648 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 691.6934 | 29.5822 | 30.83 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3714.1766 | 1325.336 | -174.98 | 437.5304 | 1043.7913 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1711.1469 | 42.6677 | 98.925 | 217.1462 | 520.2767 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 274.3799 | 30.2245 | 43.2033 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1358.9873 | 157.2313 | -410.0663 | 202.4719 | 505.6023 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1230.0481 | 225.3895 | 227.5697 | 224.8788 | 585.7483 |
| Top | Leg 14 | OS | 204] 1.2 [DL + LL + RSX] | 136.9888 | 6.7857 | 200.4919 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1068.3 | 206] [0.9 DL + 1.5 RSX] | 1353.1462 | 144.1871 | -849.8965 | 202.2285 | 849.8965 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 21.415 | 15.3901 | 32.6152 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2043.0777 | 58.207 | -91.2341 | 250.0174 | 596.4522 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3889.3798 | 1316.2681 | -174.6794 | 437.5304 | 1043.7913 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 706.2314 | 33.1449 | 30.1597 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1448.5684 | 191.9461 | 397.8277 | 206.2047 | 509.3351 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 952.0613 | 373.0674 | 230.1374 | 213.2952 | 574.1647 |
| Bottom | Leg 7 | OS | 206] [0.9 DL + 1.5 RSX] | 74.8826 | -8.9837 | -203.838 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 690.3236 | 31.4683 | -29.4559 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3868.7769 | 1359.5102 | -179.2197 | 437.5304 | 1043.7913 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1746.5949 | 69.6393 | 108.2847 | 218.6233 | 521.7538 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 11.4723 | 14.7697 | 33.7899 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1395.9398 | 191.2189 | -393.7235 | 204.0117 | 507.1421 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 862.8429 | 371.4214 | 226.2316 | 209.5775 | 570.447 |
| Bottom | Leg 14 | OS | 206] [0.9 DL + 1.5 RSX] | 65.0935 | 9.3754 | 203.5948 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1107.52 | 206] [0.9 DL + 1.5 RSX] | 1408.4968 | 229.6127 | 875.9813 | 204.5349 | 875.9813 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 733.8292 | -15.5087 | 12.08 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 733.8292 | 30.8524 | 14.96 | 5 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3636.0567 | -228.4 | 8.76 | 5 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3636.0567 | 295.5611 | 9.11 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5239.1404 | -1145.0114 | 8.18 | 5 |
| Top–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5239.1404 | 1286.4852 | 8.42 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1044.7206 | -30.2465 | 7.95 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1332.1587 | 2.5355 | 8.44 | 5 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3118.1382 | -164.5615 | 8.54 | 5 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3118.1382 | 134.7909 | 8.34 | 5 |
| Top–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4277.9638 | -306.1878 | 10.03 | 5 |
| Top–Right | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4277.9638 | 214.4023 | 9.59 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 724.9971 | -8.8538 | 10.72 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 724.9971 | 10.266 | 10.99 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1325.5332 | -1.2031 | 8.34 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1044.0774 | 29.5822 | 7.91 | 5 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5238.526 | -1096.3337 | 8.1 | 5 |
| Top–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5238.526 | 1325.336 | 8.49 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3198.2267 | -202.7786 | 8.99 | 5 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3198.2267 | 165.4567 | 8.74 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 721.2353 | -15.0486 | 11.84 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 721.2353 | 30.2245 | 14.68 | 5 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3094.6465 | -142.4041 | 8.34 | 5 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3094.6465 | 157.2313 | 8.44 | 5 |
| Top–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4216.1273 | -295.8056 | 9.85 | 5 |
| Top–Right | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4216.1273 | 225.3895 | 9.51 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 721.5787 | -10.9537 | 11.07 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 721.5787 | 8.5424 | 10.62 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2473.0691 | -0.5178 | 5.89 | 5 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2274.1172 | 143.2291 | 6.39 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 807.8191 | -28.8407 | 15.51 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 807.8191 | 15.3901 | 12.98 | 5 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3688.0664 | -256.6393 | 9.02 | 5 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3688.0664 | 234.6058 | 8.91 | 5 |
| Bottom–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5503.2458 | -1187.3254 | 8.57 | 5 |
| Botttom–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5591.1169 | 112.89 | 6.85 | 5 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1048.0464 | -31.4437 | 8.02 | 5 |
| Botttom–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1376.4415 | 1.6035 | 8.68 | 5 |
| Bottom–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3273.4546 | -196.8674 | 9.13 | 5 |
| Botttom–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3273.4546 | 191.9461 | 9.1 | 5 |
| Bottom–Left | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 4539.8028 | -165.6793 | 9.87 | 5 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4539.8028 | 373.0674 | 10.87 | 5 |
| Bottom–Left | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 676.4732 | -1.7755 | 8.79 | 5 |
| Botttom–Right | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 676.4732 | 3.6872 | 9.15 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1367.8925 | -2.458 | 8.66 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1367.8925 | 1.0104 | 8.6 | 5 |
| Bottom–Left | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 5583.9802 | -8.599 | 6.66 | 5 |
| Botttom–Right | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 5456.6662 | 1359.5102 | 8.81 | 5 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3265.6498 | -152.8709 | 8.82 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3265.6498 | 171.0568 | 8.94 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 795.4629 | -28.286 | 15.25 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 795.4629 | 14.7697 | 12.71 | 5 |
| Bottom–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3251.0036 | -196.9548 | 9.08 | 5 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3251.0036 | 191.2189 | 9.04 | 5 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4499.9925 | -176.5809 | 9.85 | 5 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4499.9925 | 371.4214 | 10.78 | 5 |
| Bottom–Left | Leg 14 | 200 | 203] 1.5 [DL + RSY] | 663.8155 | -2.393 | 8.75 | 5 |
| Botttom–Right | Leg 14 | 200 | 203] 1.5 [DL + RSY] | 663.8155 | 1.4367 | 8.57 | 5 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2579.3725 | -1.4508 | 6.15 | 5 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2366.3456 | 227.8702 | 7.18 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 8F(+26.6) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.439 | 203] 1.5 [DL + RSY] | 35930.1163 | -9335.0311 | -354.2161 |
| Bottom | 0.455 | 203] 1.5 [DL + RSY] | 36577.2502 | -11680.8824 | -345.3739 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 304.6782 | 29.9832 | 41.1151 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2148.6373 | 109.035 | -109.0612 | 313.7797 | 660.2145 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 3894.9707 | 1334.4043 | -181.5831 | 549.1145 | 1155.3753 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 729.9541 | 34.0143 | -29.9959 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1450.1969 | 141.695 | 440.1305 | 258.8785 | 562.009 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1338.5839 | 209.6273 | 240.7152 | 287.906 | 648.7755 |
| Top | Leg 7 | OS | 206] [0.9 DL + 1.5 RSX] | -64.1961 | -8.9558 | -206.6852 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 711.2941 | 28.9768 | 30.1913 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 3862.7403 | 1369.8784 | -192.9878 | 549.1145 | 1155.3753 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1826.8954 | 40.691 | 106.5144 | 274.5572 | 577.6877 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 290.3259 | 29.3724 | 41.5172 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1395.61 | 156.7064 | -435.8495 | 256.0238 | 559.1543 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1246.105 | 218.2879 | 237.8973 | 283.0696 | 643.9392 |
| Top | Leg 14 | OS | 206] [0.9 DL + 1.5 RSX] | -76.7006 | 8.8818 | 205.776 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1029.31 | 206] [0.9 DL + 1.5 RSX] | 1413.0155 | 143.8206 | -880.9634 | 256.9341 | 880.9634 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 16.5425 | 15.1542 | 33.337 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2141.0886 | 58.0945 | -97.0586 | 313.7797 | 660.2145 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4028.4 | 1381.0325 | -202.9772 | 549.1145 | 1155.3753 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 726.4542 | 32.6092 | 29.1669 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1461.9189 | 210.799 | 419.5584 | 259.4916 | 562.622 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 918.6027 | 364.1528 | 236.8745 | 265.9424 | 626.8119 |
| Bottom | Leg 7 | OS | 202] 1.5 [DL + RSX] | 267.5707 | -8.7117 | -216.1969 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 709.7997 | 31.2131 | -28.5512 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4009.3981 | 1425.1436 | -206.547 | 549.1145 | 1155.3753 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1833.5899 | 65.7122 | 114.0222 | 274.5572 | 577.6877 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 7.0441 | 14.5307 | 34.4509 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1407.7826 | 207.2819 | -416.1873 | 256.6604 | 559.7909 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 828.0598 | 362.0069 | 233.4235 | 261.2073 | 622.0769 |
| Bottom | Leg 14 | OS | 202] 1.5 [DL + RSX] | 252.649 | 9.2131 | 214.6851 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1116.22 | 206] [0.9 DL + 1.5 RSX] | 1467.3765 | 253.4013 | 936.4951 | 259.777 | 936.4951 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 746.7962 | -15.4001 | 12.22 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 746.7962 | 29.9832 | 14.96 | 5 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3811.4884 | -230.4467 | 9.14 | 5 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3811.4884 | 305.457 | 9.53 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5499.3978 | -1187.7504 | 8.57 | 5 |
| Top–Right | Leg 3 | 700 | 203] 1.5 [DL + RSY] | 5599.8703 | 125.141 | 6.88 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1098.052 | -29.4671 | 8.24 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1393.5454 | 3.0867 | 8.85 | 5 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3280.3073 | -163.9376 | 8.93 | 5 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3280.3073 | 141.695 | 8.77 | 5 |
| Top–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4465.333 | -296.0596 | 10.35 | 5 |
| Top–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4465.333 | 209.6273 | 9.94 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 765.9632 | -8.6041 | 11.19 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 765.9632 | 10.3623 | 11.52 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1386.2713 | -1.6008 | 8.74 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1097.978 | 28.9768 | 8.22 | 5 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5498.0182 | -1131.915 | 8.47 | 5 |
| Top–Right | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5629.9918 | 170.7175 | 6.99 | 5 |
| Top–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3352.1455 | -209.2939 | 9.41 | 5 |
| Top–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3352.1455 | 167.9612 | 9.12 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 735.6169 | -14.9424 | 12 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 735.6169 | 29.3724 | 14.7 | 5 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3258.3108 | -149.2277 | 8.77 | 5 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3258.3108 | 156.7064 | 8.82 | 5 |
| Top–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4406.4559 | -287.621 | 10.19 | 5 |
| Top–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4406.4559 | 218.2879 | 9.86 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 762.9563 | -10.9409 | 11.59 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 762.9563 | 8.3671 | 11.11 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2571.187 | -0.5372 | 6.13 | 5 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2375.8989 | 142.8702 | 6.63 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 854.8314 | -27.5116 | 15.84 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 854.8314 | 15.1542 | 13.53 | 5 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3876.9249 | -273.7934 | 9.5 | 5 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 3876.9249 | 256.4763 | 9.41 | 5 |
| Bottom–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 5759.592 | -1249.8513 | 8.98 | 5 |
| Botttom–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 5759.592 | 1381.0325 | 9.21 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1446.3316 | -0.0973 | 9.04 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1446.3316 | 1.377 | 9.1 | 5 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3449.3689 | -213.0983 | 9.66 | 5 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3449.3689 | 210.799 | 9.65 | 5 |
| Bottom–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4801.9732 | -170.3857 | 10.42 | 5 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4801.9732 | 364.1528 | 11.35 | 5 |
| Bottom–Left | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 708.7779 | -1.8641 | 9.21 | 5 |
| Botttom–Right | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 708.7779 | 3.1855 | 9.46 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1437.3213 | -2.3378 | 9.09 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1437.3213 | 1.0544 | 9.03 | 5 |
| Bottom–Left | Leg 9 | 700 | 202] 1.5 [DL + RSX] | 5872.6834 | -14.4797 | 7.02 | 5 |
| Botttom–Right | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 5711.8101 | 1425.1436 | 9.22 | 5 |
| Bottom–Left | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3437.6027 | -166.1784 | 9.32 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 400 | 202] 1.5 [DL + RSX] | 3437.6027 | 182.2889 | 9.42 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 843.0692 | -26.9657 | 15.59 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 843.0692 | 14.5307 | 13.26 | 5 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3427.8615 | -215.9505 | 9.63 | 5 |
| Botttom–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3427.8615 | 207.2819 | 9.57 | 5 |
| Bottom–Left | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 4764.198 | -181.3069 | 10.4 | 5 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4764.198 | 362.0069 | 11.27 | 5 |
| Bottom–Left | Leg 14 | 200 | 203] 1.5 [DL + RSY] | 696.495 | -1.9564 | 9.07 | 5 |
| Botttom–Right | Leg 14 | 200 | 203] 1.5 [DL + RSY] | 696.495 | 1.4999 | 8.99 | 5 |
| Bottom–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2669.402 | -1.5209 | 6.37 | 5 |
| Botttom–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2465.4482 | 251.6677 | 7.58 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 7F(+23.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.459 | 203] 1.5 [DL + RSY] | 37506.7543 | -9770.267 | -346.285 |
| Bottom | 0.476 | 203] 1.5 [DL + RSY] | 38153.8882 | -12553.5391 | -338.4982 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 315.3136 | 28.9035 | 40.2478 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2279.8729 | 106.6618 | -118.3566 | 313.7797 | 660.2145 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4033.6615 | 1396.3943 | -216.2136 | 549.1145 | 1155.3753 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 747.5078 | 33.3467 | -29.2154 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1462.1258 | 152.5104 | 469.2987 | 259.5024 | 562.6328 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1315.5306 | 209.7383 | 252.9641 | 286.7004 | 647.5699 |
| Top | Leg 7 | OS | 206] [0.9 DL + 1.5 RSX] | -76.7433 | -8.8895 | -199.3027 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 728.1052 | 28.6593 | 29.3374 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4003.005 | 1427.3048 | -227.4872 | 549.1145 | 1155.3753 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1942.7193 | 39.661 | 115.2587 | 274.5572 | 577.6877 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 300.6918 | 28.295 | 40.6347 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1406.0032 | 162.642 | -465.928 | 256.5674 | 559.6978 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1222.5403 | 216.1884 | 251.1752 | 281.8373 | 642.7068 |
| Top | Leg 14 | OS | 206] [0.9 DL + 1.5 RSX] | -89.3335 | 8.8266 | 198.4314 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1129.31 | 206] [0.9 DL + 1.5 RSX] | 1471.7116 | 145.8273 | -944.6621 | 260.0037 | 944.6621 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 7.3407 | 14.7123 | 33.5826 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2217.8831 | 56.8491 | -104.466 | 313.7797 | 660.2145 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4157.0583 | 1476.7569 | -247.8299 | 549.1145 | 1155.3753 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 739.8172 | 32.636 | 28.6676 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1448.683 | 231.9397 | 452.851 | 258.7994 | 561.9298 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 846.2564 | 356.6785 | 247.2293 | 262.1589 | 623.0285 |
| Bottom | Leg 7 | OS | 202] 1.5 [DL + RSX] | 263.5516 | -8.5945 | -207.0493 | 18.5891 | 76.3282 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 722.4851 | 31.0682 | -28.0524 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4140.8575 | 1522.6168 | -248.811 | 549.1145 | 1155.3753 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1900.8055 | 60.8392 | 121.5111 | 274.5572 | 577.6877 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -2.1325 | 14.1018 | 34.661 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1393.2202 | 230.0006 | 455.5781 | 255.8989 | 559.0293 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 753.8831 | 354.8282 | 244.643 | 257.3281 | 618.1977 |
| Bottom | Leg 14 | OS | 202] 1.5 [DL + RSX] | 248.4762 | 9.0281 | 205.9032 | 18.5891 | 76.3282 |
| Bottom | Leg 15 | 1258.5 | 206] [0.9 DL + 1.5 RSX] | 1524.0347 | 284.1751 | -1025.7185 | 262.74 | 1025.7185 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 2

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 766.0634 | -15.2023 | 12.43 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 766.0634 | 28.9035 | 15 | 5 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4011.073 | -249.7329 | 9.66 | 5 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4011.073 | 325.2446 | 10.05 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 5755.5963 | -1248.5987 | 8.98 | 5 |
| Top–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 5755.5963 | 1396.3943 | 9.23 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1157.1468 | -29.147 | 8.6 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1462.9439 | 2.9899 | 9.28 | 5 |
| Top–Left | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3457.3235 | -169.7922 | 9.39 | 5 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3457.3235 | 152.5104 | 9.27 | 5 |
| Top–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4700.3336 | -286.5186 | 10.78 | 5 |
| Top–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4700.3336 | 209.7383 | 10.41 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 810.4613 | -8.5597 | 11.74 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 810.4613 | 10.2088 | 12.04 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1455.3982 | -1.5215 | 9.17 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1158.1357 | 28.6593 | 8.58 | 5 |
| Top–Left | Leg 9 | 700 | 203] 1.5 [DL + RSY] | 5752.6971 | -1188.2975 | 8.87 | 5 |
| Top–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 5752.6971 | 1427.3048 | 9.28 | 5 |
| Top–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3530.268 | -222.8233 | 9.92 | 5 |
| Top–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3530.268 | 182.7766 | 9.65 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 755.9999 | -14.7746 | 12.22 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 755.9999 | 28.295 | 14.76 | 5 |
| Top–Left | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3436.465 | -160.0288 | 9.27 | 5 |
| Top–Right | Leg 12 | 400 | 202] 1.5 [DL + RSX] | 3436.465 | 162.642 | 9.29 | 5 |
| Top–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4645.3558 | -279.6569 | 10.63 | 5 |
| Top–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4645.3558 | 216.1884 | 10.33 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 808.1157 | -10.7254 | 12.11 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 808.1157 | 8.3519 | 11.67 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2660.8164 | -0.4081 | 6.34 | 5 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2474.9187 | 144.9017 | 6.88 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 908.0805 | -26.0578 | 16.24 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 908.0805 | 14.7123 | 14.11 | 5 |
| Bottom–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4090.6734 | -293.9081 | 10.05 | 5 |
| Botttom–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4090.6734 | 280.3902 | 9.98 | 5 |
| Bottom–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6010.8324 | -1344.5191 | 9.44 | 5 |
| Botttom–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6010.8324 | 1476.7569 | 9.67 | 5 |
| Bottom–Left | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1523.322 | -0.0067 | 9.52 | 5 |
| Botttom–Right | Leg 4 | 200 | 203] 1.5 [DL + RSY] | 1523.322 | 1.4243 | 9.59 | 5 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3650.9026 | -235.891 | 10.3 | 5 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3650.9026 | 231.9397 | 10.27 | 5 |
| Bottom–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5109.0313 | -172.3135 | 11.05 | 5 |
| Botttom–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5109.0313 | 356.6785 | 11.93 | 5 |
| Bottom–Left | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 745.0334 | -1.793 | 9.65 | 5 |
| Botttom–Right | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 745.0334 | 2.9863 | 9.87 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1513.8977 | -2.3598 | 9.57 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1513.8977 | 0.8959 | 9.5 | 5 |
| Bottom–Left | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 5961.8907 | -1361.6616 | 9.41 | 5 |
| Botttom–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 5961.8907 | 1522.6168 | 9.69 | 5 |
| Bottom–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3632.322 | -180.7681 | 9.88 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3632.322 | 194.6681 | 9.97 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 896.4636 | -25.5184 | 15.99 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 896.4636 | 14.1018 | 13.85 | 5 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3630.9417 | -237.1926 | 10.26 | 5 |
| Botttom–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3630.9417 | 230.0006 | 10.21 | 5 |
| Bottom–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5073.5607 | -182.1988 | 11.02 | 5 |
| Botttom–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5073.5607 | 354.8282 | 11.85 | 5 |
| Bottom–Left | Leg 14 | 200 | 203] 1.5 [DL + RSY] | 732.5735 | -1.8077 | 9.5 | 5 |
| Botttom–Right | Leg 14 | 200 | 203] 1.5 [DL + RSY] | 732.5735 | 1.425 | 9.42 | 5 |
| Bottom–Left | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 2561.0708 | -291.182 | 8.08 | 5 |
| Botttom–Right | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 2561.0708 | 282.4234 | 8.02 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 6F(20.3) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.479 | 203] 1.5 [DL + RSY] | 39061.0236 | -10463.4466 | -340.7383 |
| Bottom | 0.498 | 203] 1.5 [DL + RSY] | 39708.1575 | -13814.5968 | -332.8673 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 319.9952 | 27.5172 | 39.5178 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2394.2989 | 102.0829 | -129.2976 | 313.7797 | 660.2145 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4161.9359 | 1485.6685 | -264.2965 | 549.1145 | 1155.3753 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 758.2473 | 32.844 | -28.6346 | 48.4085 | 163.8868 |
| Top | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1447.1706 | 163.6848 | 513.142 | 258.7203 | 561.8507 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1246.6104 | 210.5956 | 269.3278 | 283.0961 | 643.9656 |
| Top | Leg 7 | OS | 202] 1.5 [DL + RSX] | 96.0867 | -8.3875 | -213.5741 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 738.1552 | 28.2558 | 28.6728 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4134.309 | 1513.0591 | -273.8545 | 549.1145 | 1155.3753 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2042.5958 | 37.7143 | 125.7195 | 274.5572 | 577.6877 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 304.6652 | 26.9147 | 39.876 | 18.5891 | 76.3282 |
| Top | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 1389.6971 | 173.5333 | -510.7823 | 255.7146 | 558.845 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1152.4324 | 215.7265 | 268.1556 | 278.1709 | 639.0404 |
| Top | Leg 14 | OS | 202] 1.5 [DL + RSX] | 79.4084 | 8.2113 | 211.2609 | 18.5891 | 76.3282 |
| Top | Leg 15 | 1276.77 | 206] [0.9 DL + 1.5 RSX] | 1528.2187 | 151.134 | -1037.0145 | 262.9588 | 1037.0145 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -7.4825 | 14.1238 | 33.8611 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2254.8985 | 54.4911 | -113.8644 | 313.7797 | 660.2145 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4277.9254 | 1622.9365 | -303.6528 | 549.1145 | 1155.3753 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 744.6827 | 33.1377 | 28.3608 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 1402.1859 | 258.5264 | -502.4537 | 256.3677 | 559.4982 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 721.4533 | 348.3613 | 261.3991 | 255.6321 | 616.5017 |
| Bottom | Leg 7 | 1535.14 | 202] 1.5 [DL + RSX] | 246.9796 | 9.5579 | -195.8644 | 18.5891 | 195.8644 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 726.6747 | 31.3127 | -27.7713 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4265.097 | 1670.5044 | -301.6334 | 549.1145 | 1155.3753 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1931.614 | 54.9683 | 131.6037 | 274.5572 | 577.6877 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -17.1218 | 13.5331 | 34.8912 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 507.97 | 206] [0.9 DL + 1.5 RSX] | 302.8756 | 259.3246 | 506.8378 | 198.8775 | 506.8378 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 626.6068 | 346.7788 | 259.2936 | 250.672 | 611.5415 |
| Bottom | Leg 14 | 1528.16 | 202] 1.5 [DL + RSX] | 231.5533 | 8.7782 | 195.0579 | 18.5891 | 195.0579 |
| Bottom | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1579.1427 | 323.829 | -1141.3366 | 265.622 | 568.7524 |

Number of legs where shear force exceeds max allowed (top, bottom) = 2, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 792.0281 | -14.9126 | 12.7 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 792.0281 | 27.5172 | 15.06 | 5 |
| Top–Left | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4234.5682 | -271.7606 | 10.24 | 5 |
| Top–Right | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 4234.5682 | 346.3519 | 10.63 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6007.0532 | -1337.6997 | 9.43 | 5 |
| Top–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6007.0532 | 1485.6685 | 9.68 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1220.4615 | -28.6901 | 8.97 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1540.0808 | 3.0408 | 9.77 | 5 |
| Top–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3660.2267 | -180.4677 | 9.94 | 5 |
| Top–Right | Leg 5 | 400 | 202] 1.5 [DL + RSX] | 3660.2267 | 163.6848 | 9.83 | 5 |
| Top–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4986.3334 | -272.6349 | 11.28 | 5 |
| Top–Right | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 4986.3334 | 210.5956 | 10.98 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 861.3604 | -8.3875 | 12.34 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 861.3604 | 10.1898 | 12.68 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1532.2283 | -1.5288 | 9.65 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1222.4647 | 28.2558 | 8.96 | 5 |
| Top–Left | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6002.3209 | -1273.0482 | 9.31 | 5 |
| Top–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6002.3209 | 1513.0591 | 9.72 | 5 |
| Top–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3730.1219 | -237.7727 | 10.5 | 5 |
| Top–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3730.1219 | 199.2725 | 10.24 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 782.8036 | -14.5225 | 12.51 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 782.8036 | 26.9147 | 14.83 | 5 |
| Top–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3641.1004 | -171.0551 | 9.83 | 5 |
| Top–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3641.1004 | 173.5333 | 9.85 | 5 |
| Top–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4935.5797 | -266.5851 | 11.15 | 5 |
| Top–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 4935.5797 | 215.7265 | 10.91 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 859.2607 | -10.6501 | 12.74 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 859.2607 | 8.2113 | 12.28 | 5 |
| Top–Left | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2739.3671 | -0.1751 | 6.52 | 5 |
| Top–Right | Leg 15 | 300 | 203] 1.5 [DL + RSY] | 2570.5774 | 150.2344 | 7.14 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 966.8763 | -24.2779 | 16.64 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 966.8763 | 14.1238 | 14.73 | 5 |
| Bottom–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4334.8612 | -318.9159 | 10.69 | 5 |
| Botttom–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4334.8612 | 308.8765 | 10.64 | 5 |
| Bottom–Left | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 6527.8839 | -5.203 | 7.78 | 5 |
| Botttom–Right | Leg 3 | 800 | 202] 1.5 [DL + RSX] | 6527.8839 | 137.8183 | 8.01 | 5 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1233.6474 | -31.5143 | 9.19 | 5 |
| Botttom–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1612.1369 | 1.5142 | 10.15 | 5 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3884.102 | -264.156 | 11.04 | 5 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3884.102 | 258.5264 | 11.01 | 5 |
| Bottom–Left | Leg 6 | 600 | 202] 1.5 [DL + RSX] | 5467.8829 | -174.1617 | 11.77 | 5 |
| Botttom–Right | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5467.8829 | 348.3613 | 12.61 | 5 |
| Bottom–Left | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 788.151 | -1.6922 | 10.17 | 5 |
| Botttom–Right | Leg 7 | 200 | 203] 1.5 [DL + RSY] | 788.151 | 2.8247 | 10.38 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1602.288 | -2.4071 | 10.13 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1602.288 | 0.6616 | 10.05 | 5 |
| Bottom–Left | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 6526.211 | -39.4781 | 7.84 | 5 |
| Botttom–Right | Leg 9 | 800 | 202] 1.5 [DL + RSX] | 6209.9899 | 1670.5044 | 10.23 | 5 |
| Bottom–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3855.3165 | -198.1188 | 10.53 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3855.3165 | 210.1943 | 10.61 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 955.4618 | -23.7545 | 16.4 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 955.4618 | 13.5331 | 14.48 | 5 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3866.0687 | -263.9181 | 11 | 5 |
| Botttom–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3866.0687 | 258.1763 | 10.96 | 5 |
| Bottom–Left | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5434.5904 | -182.7402 | 11.75 | 5 |
| Botttom–Right | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 5434.5904 | 346.7788 | 12.53 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 777.1118 | -9.1686 | 11.43 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 777.1118 | 8.7782 | 11.36 | 5 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2816.4139 | -1.8841 | 6.72 | 5 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2654.6287 | 322.0507 | 8.51 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 5F(17.15) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.5 | 203] 1.5 [DL + RSY] | 40585.893 | -11608.5323 | -336.7613 |
| Bottom | 0.524 | 202] 1.5 [DL + RSX] | 35465.2662 | 807.5201 | -39973.9499 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 313.5289 | 25.8399 | 38.4733 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1739.6115 | 368.8178 | -150.0094 | 300.1623 | 646.597 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4282.4035 | 1620.4982 | -319.8808 | 549.1145 | 1155.3753 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 760.4698 | 32.2177 | -28.214 | 48.4085 | 163.8868 |
| Top | Leg 5 | 591.65 | 206] [0.9 DL + 1.5 RSX] | 339.7323 | 179.7256 | 559.497 | 200.805 | 559.497 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 1115.0614 | 208.2628 | 289.5107 | 276.2165 | 637.0861 |
| Top | Leg 7 | OS | 202] 1.5 [DL + RSX] | 77.3609 | -8.1501 | -201.1792 | 18.5891 | 76.3282 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 739.7019 | 27.7144 | 28.1805 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4258.7417 | 1645.7847 | -327.0906 | 549.1145 | 1155.3753 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2101.4249 | 35.0515 | -137.9715 | 274.5572 | 577.6877 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 297.4397 | 25.2516 | 38.7999 | 18.5891 | 76.3282 |
| Top | Leg 12 | 595.39 | 206] [0.9 DL + 1.5 RSX] | 295.8619 | 186.0936 | -559.4716 | 198.5107 | 559.4716 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 1018.9435 | 212.2974 | 288.7241 | 271.1899 | 632.0594 |
| Top | Leg 14 | OS | 202] 1.5 [DL + RSX] | 60.2683 | 8.0014 | 199.1116 | 18.5891 | 76.3282 |
| Top | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1583.2197 | 159.1811 | -1155.1352 | 265.8352 | 568.9656 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -30.1304 | 13.2765 | -35.3639 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 203] 1.5 [DL + RSY] | 2234.2863 | 51.0661 | -124.5983 | 313.7797 | 660.2145 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4391.9916 | 1838.3304 | -364.9465 | 549.1145 | 1155.3753 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 740.1312 | 34.3548 | 28.1928 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 613.04 | 206] [0.9 DL + 1.5 RSX] | 219.1801 | 294.5646 | -566.163 | 194.5005 | 566.163 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 526.5114 | 338.4098 | 279.0327 | 245.4373 | 606.3069 |
| Bottom | Leg 7 | 1417.38 | 202] 1.5 [DL + RSX] | 214.3722 | 9.3052 | -182.266 | 18.5891 | 182.266 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 721.4817 | 32.2563 | -27.6217 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4383.2279 | 1887.1674 | -359.8719 | 549.1145 | 1155.3753 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1910.4041 | 47.5682 | 143.0992 | 274.5572 | 577.6877 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -40.2389 | 12.7131 | -35.2359 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 623.78 | 206] [0.9 DL + 1.5 RSX] | 175.0633 | 294.7589 | 570.3686 | 192.1934 | 570.3686 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 428.7878 | 336.7829 | 277.2223 | 240.3267 | 601.1963 |
| Bottom | Leg 14 | 1413.36 | 202] 1.5 [DL + RSX] | 198.5736 | 8.516 | 181.8019 | 18.5891 | 181.8019 |
| Bottom | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1632.9798 | 373.943 | -1277.2772 | 268.4375 | 571.5679 |

Number of legs where shear force exceeds max allowed (top, bottom) = 3, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 827.7336 | -14.4018 | 13.05 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 827.7336 | 25.8399 | 15.19 | 5 |
| Top–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4487.5879 | -296.0047 | 10.89 | 5 |
| Top–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4487.5879 | 368.8178 | 11.27 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6257.3938 | -1472.9582 | 9.95 | 5 |
| Top–Right | Leg 3 | 800 | 203] 1.5 [DL + RSY] | 6541.9757 | 146.0135 | 8.04 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1290.404 | -28.1202 | 9.38 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1630.0042 | 3.0813 | 10.33 | 5 |
| Top–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3895.1457 | -193.4855 | 10.59 | 5 |
| Top–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 3895.1457 | 176.2856 | 10.47 | 5 |
| Top–Left | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5333.0256 | -255.3999 | 11.89 | 5 |
| Top–Right | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5333.0256 | 208.2628 | 11.67 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 920.3588 | -8.1501 | 13.03 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 920.3588 | 10.1451 | 13.41 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1621.7769 | -1.5334 | 10.21 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1293.3904 | 27.7144 | 9.38 | 5 |
| Top–Left | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6249.9962 | -1405.4429 | 9.83 | 5 |
| Top–Right | Leg 9 | 800 | 203] 1.5 [DL + RSY] | 6590.6206 | 167.0094 | 8.13 | 5 |
| Top–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3956.8937 | -253.8886 | 11.15 | 5 |
| Top–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 3956.8937 | 217.6961 | 10.9 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 819.3308 | -14.0511 | 12.88 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 819.3308 | 25.2516 | 14.98 | 5 |
| Top–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3878.0802 | -183.5334 | 10.48 | 5 |
| Top–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 3878.0802 | 186.7336 | 10.5 | 5 |
| Top–Left | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 5286.4539 | -250.0937 | 11.77 | 5 |
| Top–Right | Leg 13 | 600 | 202] 1.5 [DL + RSX] | 5286.4539 | 212.2974 | 11.59 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 918.4076 | -10.5517 | 13.46 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 918.4076 | 8.0014 | 12.98 | 5 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2809.1152 | -4.5023 | 6.72 | 5 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2809.1152 | 0.1102 | 6.69 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1033.2911 | -22.1327 | 17.07 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1033.2911 | 13.2765 | 15.41 | 5 |
| Bottom–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4619.3258 | -353.6198 | 11.47 | 5 |
| Botttom–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4619.3258 | 347.0632 | 11.43 | 5 |
| Bottom–Left | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6509.9117 | -1706.1276 | 10.65 | 5 |
| Botttom–Right | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6509.9117 | 1838.3304 | 10.88 | 5 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1309.326 | -32.4945 | 9.71 | 5 |
| Botttom–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1717.8026 | 1.642 | 10.81 | 5 |
| Bottom–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4156.4795 | -299.9035 | 11.94 | 5 |
| Botttom–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4156.4795 | 293.2298 | 11.89 | 5 |
| Bottom–Left | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5892.9548 | -175.517 | 12.63 | 5 |
| Botttom–Right | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5892.9548 | 338.4098 | 13.41 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 849.9047 | -8.2543 | 12.17 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 849.9047 | 9.3052 | 12.37 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1707.5888 | -2.4393 | 10.79 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1707.5888 | 0.4076 | 10.69 | 5 |
| Bottom–Left | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6457.6094 | -1723.1668 | 10.62 | 5 |
| Botttom–Right | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6457.6094 | 1887.1674 | 10.9 | 5 |
| Bottom–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4116.6067 | -222.0817 | 11.31 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4116.6067 | 231.9323 | 11.38 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1022.1559 | -21.6368 | 16.83 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1022.1559 | 12.7131 | 15.16 | 5 |
| Bottom–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4140.5877 | -298.8501 | 11.89 | 5 |
| Botttom–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4140.5877 | 293.7362 | 11.86 | 5 |
| Bottom–Left | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 5861.6202 | -182.7969 | 12.6 | 5 |
| Botttom–Right | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 5861.6202 | 336.7829 | 13.34 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 841.9134 | -8.896 | 12.19 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 841.9134 | 8.516 | 12.12 | 5 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2879.1275 | -2.0483 | 6.87 | 5 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2746.6747 | 372.1412 | 9.07 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 4F(+14) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.45 | 203] 1.5 [DL + RSY] | 42072.4788 | -13386.3974 | -332.1597 |
| Bottom | 0.481 | 202] 1.5 [DL + RSX] | 36650.1411 | 836.7534 | -46008.012 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 289.8527 | 23.7789 | 37.0001 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1656.9958 | 395.5911 | -179.4362 | 352.6497 | 699.0845 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4395.892 | 1819.9641 | -377.8606 | 654.5562 | 1260.8171 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 753.4077 | 31.1525 | -27.8806 | 48.4085 | 163.8868 |
| Top | Leg 5 | 653.64 | 206] [0.9 DL + 1.5 RSX] | 211.3304 | 195.3246 | 627.6367 | 231.3595 | 627.6367 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 900.3782 | 202.3873 | 312.2581 | 315.8729 | 676.7425 |
| Top | Leg 7 | 1449.26 | 202] 1.5 [DL + RSX] | 48.0877 | 9.9671 | -185.9475 | 18.5891 | 185.9475 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 732.018 | 26.7692 | 27.7564 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4377.4105 | 1845.4478 | -382.5182 | 654.5562 | 1260.8171 |
| Top | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 2092.8579 | 31.1013 | -151.8703 | 327.2781 | 630.4085 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 272.959 | 23.2101 | 37.3016 | 18.5891 | 76.3282 |
| Top | Leg 12 | 658.98 | 206] [0.9 DL + 1.5 RSX] | 165.3908 | 201.8049 | -628.0066 | 228.4956 | 628.0066 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 801.866 | 205.2476 | 311.5618 | 309.7318 | 670.6014 |
| Top | Leg 14 | 1433.47 | 202] 1.5 [DL + RSX] | 30.6589 | 7.6886 | 184.1239 | 18.5891 | 184.1239 |
| Top | Leg 15 | OS | 206] [0.9 DL + 1.5 RSX] | 1636.9607 | 169.8467 | -1292.714 | 320.2314 | 623.3618 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -63.5484 | 12.0685 | -37.2557 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1610.2962 | 401.4645 | -147.4878 | 349.7385 | 696.1733 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4498.6692 | 2134.7823 | -426.9448 | 654.5562 | 1260.8171 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 727.1494 | 36.2569 | 27.9764 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 690.06 | 206] [0.9 DL + 1.5 RSX] | 43.0139 | 340.2756 | -639.2258 | 220.8668 | 639.2258 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 242.4445 | 326.2724 | 299.1759 | 274.8582 | 635.7278 |
| Bottom | Leg 7 | 1273.6 | 202] 1.5 [DL + RSX] | 162.7556 | 9.0624 | -165.6626 | 18.5891 | 165.6626 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 707.9333 | 33.8489 | -27.4299 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4495.3135 | 2184.7398 | -418.675 | 654.5562 | 1260.8171 |
| Bottom | Leg 10 | 500 | 203] 1.5 [DL + RSY] | 1830.8023 | 38.063 | 154.5506 | 327.2781 | 630.4085 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -74.616 | 11.5437 | -37.1172 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 700.73 | 206] [0.9 DL + 1.5 RSX] | -3.4533 | 340.5843 | 643.0105 | 218.1854 | 643.0105 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 141.802 | 323.9666 | 297.4142 | 268.5843 | 629.4538 |
| Bottom | Leg 14 | 1272.69 | 202] 1.5 [DL + RSX] | 146.8056 | 8.3017 | 165.5572 | 18.5891 | 165.5572 |
| Bottom | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2651.8679 | 346.861 | -1137.4335 | 327.2781 | 630.4085 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 879.0894 | -13.6219 | 13.54 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 879.0894 | 23.7789 | 15.45 | 5 |
| Top–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4779.7384 | -325.1042 | 11.65 | 5 |
| Top–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4779.7384 | 395.5911 | 12.02 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6507.9461 | -1673.7805 | 10.59 | 5 |
| Top–Right | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6507.9461 | 1819.9641 | 10.84 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1368.3088 | -27.1523 | 9.82 | 5 |
| Top–Right | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1737.8949 | 3.0866 | 11.01 | 5 |
| Top–Left | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4169.7176 | -209.1872 | 11.35 | 5 |
| Top–Right | Leg 5 | 500 | 202] 1.5 [DL + RSX] | 4169.7176 | 191.859 | 11.23 | 5 |
| Top–Left | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5757.8766 | -234.5579 | 12.64 | 5 |
| Top–Right | Leg 6 | 700 | 202] 1.5 [DL + RSX] | 5757.8766 | 202.3873 | 12.49 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 989.5257 | -7.8118 | 13.83 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 989.5257 | 9.9671 | 14.24 | 5 |
| Top–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1729.2827 | -1.5069 | 10.88 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1372.3765 | 26.7692 | 9.83 | 5 |
| Top–Left | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6497.0211 | -1606.1221 | 10.47 | 5 |
| Top–Right | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6497.0211 | 1845.4478 | 10.87 | 5 |
| Top–Left | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4220.1584 | -273.4447 | 11.91 | 5 |
| Top–Right | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 4220.1584 | 239.5982 | 11.68 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 871.3504 | -13.3176 | 13.39 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 871.3504 | 23.2101 | 15.24 | 5 |
| Top–Left | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4154.8833 | -199.1067 | 11.25 | 5 |
| Top–Right | Leg 12 | 500 | 202] 1.5 [DL + RSX] | 4154.8833 | 202.4794 | 11.27 | 5 |
| Top–Left | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 5715.3152 | -230.1858 | 12.54 | 5 |
| Top–Right | Leg 13 | 700 | 202] 1.5 [DL + RSX] | 5715.3152 | 205.2476 | 12.42 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 987.6788 | -10.3178 | 14.28 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 987.6788 | 7.6886 | 13.79 | 5 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2875.3675 | -4.7441 | 6.88 | 5 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2875.3675 | 0.3899 | 6.85 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1110.0995 | -19.5771 | 17.55 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1110.0995 | 12.0685 | 16.14 | 5 |
| Bottom–Left | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4957.5979 | -403.7391 | 12.43 | 5 |
| Botttom–Right | Leg 2 | 600 | 202] 1.5 [DL + RSX] | 4957.5979 | 401.4645 | 12.42 | 5 |
| Bottom–Left | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6758.5934 | -2002.4189 | 11.45 | 5 |
| Botttom–Right | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6758.5934 | 2134.7823 | 11.68 | 5 |
| Bottom–Left | Leg 4 | 200 | 207] [0.9 DL + 1.5 RSY] | 1419.9963 | -0.1106 | 8.88 | 5 |
| Botttom–Right | Leg 4 | 300 | 207] [0.9 DL + 1.5 RSY] | 1843.8652 | 0.3134 | 11.54 | 5 |
| Bottom–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4475.783 | -346.0593 | 13.01 | 5 |
| Botttom–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4475.783 | 338.8296 | 12.96 | 5 |
| Bottom–Left | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6401.9954 | -175.8734 | 13.65 | 5 |
| Botttom–Right | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6401.9954 | 326.2724 | 14.37 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 932.0146 | -8.1394 | 13.18 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 932.0146 | 9.0624 | 13.35 | 5 |
| Bottom–Left | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1833.3672 | -2.4889 | 11.58 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1833.3672 | 0.1166 | 11.46 | 5 |
| Bottom–Left | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6704.6675 | -2018.8446 | 11.42 | 5 |
| Botttom–Right | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6704.6675 | 2184.7398 | 11.7 | 5 |
| Bottom–Left | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4430.0654 | -257.6567 | 12.3 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4430.0654 | 263.7332 | 12.34 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1099.3686 | -19.123 | 17.33 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1099.3686 | 11.5437 | 15.91 | 5 |
| Bottom–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4462.3438 | -344.8206 | 12.97 | 5 |
| Botttom–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4462.3438 | 339.5252 | 12.93 | 5 |
| Bottom–Left | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6372.2863 | -181.9947 | 13.62 | 5 |
| Botttom–Right | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6372.2863 | 323.9666 | 14.3 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 925.1252 | -8.624 | 13.18 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 925.1252 | 8.3017 | 13.12 | 5 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2946.8662 | -2.0344 | 7.03 | 5 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2836.8584 | 433.7242 | 9.7 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 3F(+10.85) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.472 | 202] 1.5 [DL + RSX] | 37160.0085 | 812.136 | -43446.0005 |
| Bottom | 0.528 | 202] 1.5 [DL + RSX] | 37807.1424 | 873.389 | -53554.7247 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 242.8468 | 21.1986 | 35.2095 | 18.5891 | 76.3282 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1517.3427 | 431.6193 | -214.6279 | 343.9439 | 690.3787 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4501.6404 | 2097.6087 | -433.2041 | 654.5562 | 1260.8171 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 738.4643 | 29.5811 | -28.2214 | 48.4085 | 163.8868 |
| Top | Leg 5 | 791.61 | 206] [0.9 DL + 1.5 RSX] | 32.0705 | 216.8298 | 700.1053 | 220.1846 | 700.1053 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 581.8723 | 193.7426 | 335.1137 | 296.0177 | 656.8872 |
| Top | Leg 7 | 1286.25 | 202] 1.5 [DL + RSX] | 5.7191 | 9.5966 | -167.1232 | 18.5891 | 167.1232 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 716.5599 | 25.281 | 28.0073 | 48.4085 | 163.8868 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4490.3774 | 2126.5119 | -435.2333 | 654.5562 | 1260.8171 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1170.2894 | 267.3376 | -180.1335 | 291.1397 | 594.2701 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 224.9732 | 20.6536 | 35.4817 | 18.5891 | 76.3282 |
| Top | Leg 12 | 795.28 | 206] [0.9 DL + 1.5 RSX] | -16.1654 | 222.8086 | -700.3344 | 218.1854 | 700.3344 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 480.9364 | 195.1778 | 334.1408 | 289.7255 | 650.595 |
| Top | Leg 14 | 1272.62 | 202] 1.5 [DL + RSX] | -11.7242 | 7.2008 | 165.5487 | 18.5891 | 165.5487 |
| Top | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2658.023 | 147.0627 | -1149.9042 | 327.2781 | 630.4085 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -112.4639 | 10.4601 | -39.7967 | 18.5891 | 76.3282 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1407.1252 | 479.7202 | -186.1863 | 337.0731 | 683.5079 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4593.8793 | 2514.7799 | -484.4541 | 654.5562 | 1260.8171 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 711.3349 | 40.5216 | 28.3418 | 48.4085 | 163.8868 |
| Bottom | Leg 5 | 823 | 206] [0.9 DL + 1.5 RSX] | -188.8027 | 399.6044 | -717.1399 | 218.1854 | 717.1399 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -146.5683 | 313.7888 | 319.9946 | 259.7445 | 620.6141 |
| Bottom | Leg 7 | 1083.12 | 202] 1.5 [DL + RSX] | 91.7012 | 9.3705 | -143.666 | 18.5891 | 143.666 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 691.7187 | 37.8353 | -27.7679 | 48.4085 | 163.8868 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4597.9353 | 2567.2116 | -472.4157 | 654.5562 | 1260.8171 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 1020.2203 | 310.6304 | 178.4023 | 281.7846 | 584.915 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -125.2812 | 9.9889 | -39.6179 | 18.5891 | 76.3282 |
| Bottom | Leg 12 | 828.84 | 206] [0.9 DL + 1.5 RSX] | -237.3668 | 401.2428 | 720.6804 | 218.1854 | 720.6804 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -249.3398 | 310.0895 | 318.0562 | 259.7445 | 620.6141 |
| Bottom | Leg 14 | 1085.59 | 202] 1.5 [DL + RSX] | 76.0598 | 8.5099 | 143.9512 | 18.5891 | 143.9512 |
| Bottom | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2727.4865 | 404.5342 | 1241.4923 | 327.2781 | 630.4085 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 952.0604 | -12.4984 | 14.24 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 952.0604 | 21.1986 | 15.88 | 5 |
| Top–Left | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5124.1129 | -363.2338 | 12.57 | 5 |
| Top–Right | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5124.1129 | 431.6193 | 12.92 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6758.02 | -1952.7277 | 11.37 | 5 |
| Top–Right | Leg 3 | 900 | 203] 1.5 [DL + RSY] | 6758.02 | 2097.6087 | 11.61 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1452.6756 | -25.7095 | 10.28 | 5 |
| Top–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 1867.2426 | 3.0356 | 11.81 | 5 |
| Top–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4491.6014 | -230.1992 | 12.26 | 5 |
| Top–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4491.6014 | 213.4875 | 12.15 | 5 |
| Top–Left | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6280.506 | -210.5654 | 13.57 | 5 |
| Top–Right | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6280.506 | 193.7426 | 13.49 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1071.5839 | -7.3137 | 14.77 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1071.5839 | 9.5966 | 15.19 | 5 |
| Top–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 1858.2439 | -1.5267 | 11.69 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1457.9562 | 25.281 | 10.3 | 5 |
| Top–Left | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 6743.0639 | -1887.9127 | 11.24 | 5 |
| Top–Right | Leg 9 | 900 | 203] 1.5 [DL + RSY] | 7417.1591 | 59.4264 | 8.93 | 5 |
| Top–Left | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4533.4526 | -300.0186 | 12.83 | 5 |
| Top–Right | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4533.4526 | 267.3376 | 12.61 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 944.8059 | -12.2483 | 14.11 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 944.8059 | 20.6536 | 15.68 | 5 |
| Top–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4479.2798 | -220.9988 | 12.17 | 5 |
| Top–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4479.2798 | 223.2611 | 12.18 | 5 |
| Top–Left | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6241.6374 | -207.5509 | 13.48 | 5 |
| Top–Right | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6241.6374 | 195.1778 | 13.42 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1069.8833 | -9.8899 | 15.23 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1069.8833 | 7.2008 | 14.72 | 5 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2951.218 | -5.0129 | 7.06 | 5 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2951.218 | 0.6496 | 7.03 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1203.049 | -16.7219 | 18.17 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1203.049 | 10.4601 | 17 | 5 |
| Bottom–Left | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5363.1062 | -476.7721 | 13.66 | 5 |
| Botttom–Right | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5363.1062 | 479.7202 | 13.67 | 5 |
| Bottom–Left | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7001.6535 | -2378.8848 | 12.38 | 5 |
| Botttom–Right | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7001.6535 | 2514.7799 | 12.61 | 5 |
| Bottom–Left | Leg 4 | 200 | 207] [0.9 DL + 1.5 RSY] | 1554.4992 | -0.1197 | 9.72 | 5 |
| Botttom–Right | Leg 4 | 300 | 207] [0.9 DL + 1.5 RSY] | 1992.3118 | 2.0362 | 12.55 | 5 |
| Bottom–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4845.3866 | -407.5729 | 14.31 | 5 |
| Botttom–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4845.3866 | 397.6123 | 14.24 | 5 |
| Bottom–Left | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 7014.3401 | -175.2695 | 14.87 | 5 |
| Botttom–Right | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 7014.3401 | 313.7888 | 15.53 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1033.3677 | -8.4449 | 14.5 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1033.3677 | 9.3705 | 14.67 | 5 |
| Bottom–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 1981.5267 | -0.1319 | 12.39 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1546.6354 | 0.4006 | 9.69 | 5 |
| Bottom–Left | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 6946.6334 | -2393.4157 | 12.34 | 5 |
| Botttom–Right | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 6946.6334 | 2567.2116 | 12.64 | 5 |
| Bottom–Left | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4810.6964 | -310.2413 | 13.56 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4810.6964 | 310.6304 | 13.57 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1193.2519 | -16.3379 | 17.98 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1193.2519 | 9.9889 | 16.79 | 5 |
| Bottom–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4835.1798 | -403.8285 | 14.26 | 5 |
| Botttom–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4835.1798 | 400.5964 | 14.24 | 5 |
| Bottom–Left | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6986.1426 | -180.2896 | 14.84 | 5 |
| Botttom–Right | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6986.1426 | 310.0895 | 15.46 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1027.6735 | -8.8781 | 14.51 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1027.6735 | 8.5099 | 14.44 | 5 |
| Bottom–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3040.3734 | -1.6582 | 7.25 | 5 |
| Botttom–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 2923.2853 | 505.712 | 10.4 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 2F(+7.7) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.519 | 202] 1.5 [DL + RSX] | 38286.5839 | 832.4477 | -51241.0814 |
| Bottom | 0.584 | 202] 1.5 [DL + RSX] | 38954.2617 | 923.3819 | 61998.0393 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 168.2202 | 17.9457 | 33.082 | 18.4421 | 76.1812 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1307.6761 | 482.5593 | -253.4258 | 330.8735 | 677.3083 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4595.3837 | 2456.8869 | -482.145 | 654.5562 | 1260.8171 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 721.3628 | 26.6256 | -27.8701 | 47.6082 | 163.0864 |
| Top | Leg 5 | 909.34 | 206] [0.9 DL + 1.5 RSX] | -202.9685 | 247.1243 | 769.4855 | 218.1854 | 769.4855 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | 143.8406 | 185.9472 | 352.6633 | 268.7114 | 629.5809 |
| Top | Leg 7 | 1053.89 | 202] 1.5 [DL + RSX] | -51.6969 | 8.7824 | -140.1429 | 18.4421 | 140.1429 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 699.2746 | 22.317 | 27.5932 | 47.6082 | 163.0864 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4593.7487 | 2493.1699 | -481.8529 | 654.5562 | 1260.8171 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 967.7713 | 304.7169 | -222.1108 | 278.515 | 581.6454 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 149.0117 | 17.4629 | 33.0988 | 18.4421 | 76.1812 |
| Top | Leg 12 | 907.48 | 206] [0.9 DL + 1.5 RSX] | -253.1311 | 253.6474 | -768.355 | 218.1854 | 768.355 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | 41.3858 | 185.6711 | 352.6155 | 262.3245 | 623.194 |
| Top | Leg 14 | 1043.9 | 202] 1.5 [DL + RSX] | -68.5828 | 6.2965 | 138.9899 | 18.4421 | 138.9899 |
| Top | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2733.4914 | 164.1435 | 1251.3083 | 327.2781 | 630.4085 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -178.7462 | 8.3088 | -42.2285 | 18.4421 | 76.1812 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 1101.7083 | 598.8978 | 240.8299 | 318.0338 | 664.4686 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4675.8145 | 2991.7205 | -534.0525 | 654.5562 | 1260.8171 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 702.2652 | 43.5479 | 26.7255 | 47.6082 | 163.0864 |
| Bottom | Leg 5 | 945.48 | 206] [0.9 DL + 1.5 RSX] | -482.5163 | 482.9653 | -791.3949 | 218.1854 | 791.3949 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -677.1678 | 309.6747 | 336.2144 | 259.7445 | 620.6141 |
| Bottom | Leg 7 | 808.07 | 202] 1.5 [DL + RSX] | 6.0927 | 10.7677 | -111.7569 | 18.4421 | 111.7569 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 682.6003 | 40.1064 | -26.0711 | 47.6082 | 163.0864 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4686.9859 | 3046.8808 | -517.9521 | 654.5562 | 1260.8171 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 715.5595 | 381.3922 | 229.2467 | 262.7924 | 565.9229 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -190.8882 | 8.0775 | -42.0196 | 18.4421 | 76.1812 |
| Bottom | Leg 12 | 949.5 | 206] [0.9 DL + 1.5 RSX] | -532.0233 | 489.7244 | 793.8301 | 218.1854 | 793.8301 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -777.3891 | 308.3336 | 335.4936 | 259.7445 | 620.6141 |
| Bottom | Leg 14 | 811.88 | 202] 1.5 [DL + RSX] | -10.2357 | 9.217 | 112.1967 | 18.4421 | 112.1967 |
| Bottom | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2799.2459 | 469.0003 | 1297.0277 | 327.2781 | 630.4085 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1052.1895 | -11.0215 | 15.22 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1052.1895 | 17.9457 | 16.52 | 5 |
| Top–Left | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5535.7137 | -416.9822 | 13.7 | 5 |
| Top–Right | Leg 2 | 700 | 202] 1.5 [DL + RSX] | 5535.7137 | 482.5593 | 14.05 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7003.4932 | -2310.1803 | 12.27 | 5 |
| Top–Right | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7003.4932 | 2456.8869 | 12.52 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1538.467 | -22.8594 | 10.69 | 5 |
| Top–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 2019.918 | 2.8059 | 12.76 | 5 |
| Top–Left | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4864.0438 | -261.6237 | 13.36 | 5 |
| Top–Right | Leg 5 | 600 | 202] 1.5 [DL + RSX] | 4864.0438 | 243.4995 | 13.24 | 5 |
| Top–Left | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6920.8157 | -186.5271 | 14.74 | 5 |
| Top–Right | Leg 6 | 800 | 202] 1.5 [DL + RSX] | 6920.8157 | 185.9472 | 14.73 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1168.204 | -6.447 | 15.81 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1168.204 | 8.7824 | 16.25 | 5 |
| Top–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2010.44 | -1.6638 | 12.64 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1544.6759 | 22.317 | 10.7 | 5 |
| Top–Left | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 6983.9969 | -2250.6126 | 12.14 | 5 |
| Top–Right | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 6983.9969 | 2493.1699 | 12.55 | 5 |
| Top–Left | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4913.2356 | -337.4614 | 13.99 | 5 |
| Top–Right | Leg 10 | 600 | 202] 1.5 [DL + RSX] | 4913.2356 | 304.7169 | 13.77 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1045.64 | -10.8797 | 15.11 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1045.64 | 17.4629 | 16.34 | 5 |
| Top–Left | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4855.0389 | -251.4535 | 13.27 | 5 |
| Top–Right | Leg 12 | 600 | 202] 1.5 [DL + RSX] | 4855.0389 | 254.1959 | 13.29 | 5 |
| Top–Left | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6885.4934 | -185.2036 | 14.66 | 5 |
| Top–Right | Leg 13 | 800 | 202] 1.5 [DL + RSX] | 6885.4934 | 185.6711 | 14.66 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1166.7929 | -9.0468 | 16.28 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1166.7929 | 6.2965 | 15.77 | 5 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3055.5228 | -5.2902 | 7.31 | 5 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3055.5228 | 0.939 | 7.28 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1313.1952 | -13.4171 | 18.93 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1313.1952 | 8.3088 | 17.97 | 5 |
| Bottom–Left | Leg 2 | 800 | 202] 1.5 [DL + RSX] | 5874.7196 | -582.0896 | 15.27 | 5 |
| Botttom–Right | Leg 2 | 800 | 202] 1.5 [DL + RSX] | 5874.7196 | 598.8978 | 15.36 | 5 |
| Bottom–Left | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7241.4311 | -2841.3867 | 13.45 | 5 |
| Botttom–Right | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7241.4311 | 2991.7205 | 13.71 | 5 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1559.909 | -40.234 | 11.64 | 5 |
| Botttom–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 2169.6823 | 2.519 | 13.68 | 5 |
| Bottom–Left | Leg 5 | 700 | 202] 1.5 [DL + RSX] | 5270.3264 | -497.6664 | 15.93 | 5 |
| Botttom–Right | Leg 5 | 700 | 202] 1.5 [DL + RSX] | 5270.3264 | 479.29 | 15.81 | 5 |
| Bottom–Left | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 7769.3207 | -174.5164 | 16.38 | 5 |
| Botttom–Right | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 7769.3207 | 309.6747 | 17.03 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1154.1119 | -9.235 | 16.16 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1154.1119 | 10.7677 | 16.45 | 5 |
| Bottom–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2158.4717 | -0.3084 | 13.5 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1708.9822 | 0.3454 | 10.7 | 5 |
| Bottom–Left | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 7184.6154 | -2853.2619 | 13.41 | 5 |
| Botttom–Right | Leg 9 | 1000 | 203] 1.5 [DL + RSY] | 7184.6154 | 3046.8808 | 13.73 | 5 |
| Bottom–Left | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5296.5061 | -390.3179 | 15.27 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5296.5061 | 381.3922 | 15.21 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1305.6451 | -13.0607 | 18.77 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1305.6451 | 8.0775 | 17.84 | 5 |
| Bottom–Left | Leg 12 | 700 | 202] 1.5 [DL + RSX] | 5263.3529 | -484.7062 | 15.83 | 5 |
| Botttom–Right | Leg 12 | 700 | 202] 1.5 [DL + RSX] | 5263.3529 | 490.979 | 15.87 | 5 |
| Bottom–Left | Leg 13 | 900 | 202] 1.5 [DL + RSX] | 7745.4668 | -176.357 | 16.34 | 5 |
| Botttom–Right | Leg 13 | 900 | 202] 1.5 [DL + RSX] | 7745.4668 | 308.3336 | 16.97 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1148.4357 | -10.2478 | 16.28 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1148.4357 | 9.217 | 16.08 | 5 |
| Bottom–Left | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 3007.3704 | -593.3958 | 11.2 | 5 |
| Botttom–Right | Leg 15 | 400 | 202] 1.5 [DL + RSX] | 3007.3704 | 585.9161 | 11.15 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| 1F(+4.45) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.577 | 202] 1.5 [DL + RSX] | 39398.0619 | 863.4626 | 60093.7432 |
| Bottom | 0.67 | 202] 1.5 [DL + RSX] | 40260.9071 | 931.0424 | 76745.7557 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 58.2644 | 12.8274 | 33.8529 | 17.4316 | 75.1707 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 998.9865 | 565.3048 | -334.2446 | 311.6302 | 658.065 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4675.0628 | 2917.3949 | -514.0349 | 654.5562 | 1260.8171 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 712.4674 | 21.8552 | -27.8156 | 42.3529 | 157.8312 |
| Top | Leg 5 | 1001.55 | 202] 1.5 [DL + RSX] | 697.1068 | 297.6226 | 834.0032 | 226.8 | 834.0032 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -453.6524 | 176.5661 | 342.1285 | 259.7445 | 620.6141 |
| Top | Leg 7 | 891.73 | 202] 1.5 [DL + RSX] | -114.2953 | 9.081 | -120.4067 | 17.4316 | 120.4067 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 690.6293 | 16.3257 | 27.3078 | 42.3529 | 157.8312 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4684.6318 | 2965.6873 | -512.7651 | 654.5562 | 1260.8171 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 668.5484 | 358.613 | -298.8215 | 226.8 | 529.9304 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | 38.4034 | 12.24 | 33.6696 | 17.4316 | 75.1707 |
| Top | Leg 12 | 997.33 | 202] 1.5 [DL + RSX] | 632.4817 | 316.9991 | -831.4406 | 226.8 | 831.4406 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -555.5531 | 175.6941 | 341.94 | 259.7445 | 620.6141 |
| Top | Leg 14 | 884.69 | 202] 1.5 [DL + RSX] | -131.6164 | 4.7199 | 119.5935 | 17.4316 | 119.5935 |
| Top | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2805.6589 | 196.2703 | 1298.2244 | 226.8 | 529.9304 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -372.2773 | 4.8384 | -46.556 | 17.4316 | 75.1707 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 562.8922 | 994.3094 | 374.2397 | 284.4447 | 630.8795 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4771.7433 | 3719.3082 | -582.1425 | 654.5562 | 1260.8171 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 708.5391 | 53.1858 | 21.3174 | 42.3529 | 157.8312 |
| Bottom | Leg 5 | 1030.35 | 206] [0.9 DL + 1.5 RSX] | -898.6084 | 646.6133 | -842.8477 | 218.1854 | 842.8477 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -1567.703 | 261.4394 | 328.368 | 259.7445 | 620.6141 |
| Bottom | Leg 7 | 500 | 202] 1.5 [DL + RSX] | -146.2781 | 10.341 | -72.0267 | 17.4316 | 75.1707 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 688.3247 | 48.5135 | -20.6951 | 42.3529 | 157.8312 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4794.5781 | 3784.9044 | -561.0798 | 654.5562 | 1260.8171 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 159.8436 | 625.5966 | 347.8933 | 226.8 | 529.9304 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -384.4154 | 4.5902 | -45.1632 | 17.4316 | 75.1707 |
| Bottom | Leg 12 | 1033.64 | 206] [0.9 DL + 1.5 RSX] | -945.6567 | 654.4979 | 844.8428 | 218.1854 | 844.8428 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -1664.7183 | 261.9053 | 327.6504 | 259.7445 | 620.6141 |
| Bottom | Leg 14 | 500 | 202] 1.5 [DL + RSX] | -163.036 | 10.1673 | 72.8275 | 17.4316 | 75.1707 |
| Bottom | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2886.3829 | 498.5045 | 1161.1055 | 226.8 | 529.9304 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 1

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1186.8725 | -7.7728 | 16.29 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1186.8725 | 12.8274 | 17.24 | 5 |
| Top–Left | Leg 2 | 800 | 202] 1.5 [DL + RSX] | 6049.5103 | -492.6832 | 15.17 | 5 |
| Top–Right | Leg 2 | 800 | 202] 1.5 [DL + RSX] | 6049.5103 | 565.3048 | 15.55 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7245.1434 | -2756.0436 | 13.31 | 5 |
| Top–Right | Leg 3 | 1000 | 203] 1.5 [DL + RSY] | 7245.1434 | 2917.3949 | 13.59 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1620.0188 | -16.8001 | 10.91 | 5 |
| Top–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 2203.7904 | 3.0854 | 13.92 | 5 |
| Top–Left | Leg 5 | 700 | 202] 1.5 [DL + RSX] | 5291.7438 | -323.7274 | 14.8 | 5 |
| Top–Right | Leg 5 | 700 | 202] 1.5 [DL + RSX] | 5291.7438 | 297.6226 | 14.62 | 5 |
| Top–Left | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 7720.5358 | -149.6531 | 16.16 | 5 |
| Top–Right | Leg 6 | 900 | 202] 1.5 [DL + RSX] | 7720.5358 | 176.5661 | 16.29 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1276.3415 | -4.6498 | 16.83 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1276.3415 | 9.081 | 17.66 | 5 |
| Top–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2193.6314 | -2.3269 | 13.82 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1626.1306 | 16.3257 | 10.93 | 5 |
| Top–Left | Leg 9 | 1000 | 202] 1.5 [DL + RSX] | 8339.0733 | -66.5616 | 10.04 | 5 |
| Top–Right | Leg 9 | 1000 | 202] 1.5 [DL + RSX] | 8339.0733 | 328.5577 | 10.49 | 5 |
| Top–Left | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5395.0359 | -393.9557 | 15.53 | 5 |
| Top–Right | Leg 10 | 700 | 202] 1.5 [DL + RSX] | 5395.0359 | 358.613 | 15.28 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1179.8779 | -7.6988 | 16.19 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1179.8779 | 12.24 | 17.04 | 5 |
| Top–Left | Leg 12 | 700 | 202] 1.5 [DL + RSX] | 5286.0028 | -304.6733 | 14.66 | 5 |
| Top–Right | Leg 12 | 700 | 202] 1.5 [DL + RSX] | 5286.0028 | 316.9991 | 14.74 | 5 |
| Top–Left | Leg 13 | 900 | 202] 1.5 [DL + RSX] | 7689.115 | -147.6806 | 16.09 | 5 |
| Top–Right | Leg 13 | 900 | 202] 1.5 [DL + RSX] | 7689.115 | 175.6941 | 16.22 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1273.9662 | -9.3852 | 17.68 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1273.9662 | 4.7199 | 16.81 | 5 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3196.5771 | -5.4092 | 7.65 | 5 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3196.5771 | 1.5318 | 7.62 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1552.7133 | -7.5363 | 20.82 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1552.7133 | 4.8384 | 20.32 | 5 |
| Bottom–Left | Leg 2 | 900 | 202] 1.5 [DL + RSX] | 6634.561 | -936.5485 | 18.7 | 5 |
| Botttom–Right | Leg 2 | 900 | 202] 1.5 [DL + RSX] | 6634.561 | 994.3094 | 19 | 5 |
| Bottom–Left | Leg 3 | 1100 | 203] 1.5 [DL + RSY] | 7537.4924 | -3557.8032 | 15.02 | 5 |
| Botttom–Right | Leg 3 | 1100 | 203] 1.5 [DL + RSY] | 7537.4924 | 3719.3082 | 15.3 | 5 |
| Bottom–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1636.8061 | -48.3739 | 12.5 | 5 |
| Botttom–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 2433.3387 | 3.4918 | 15.37 | 5 |
| Bottom–Left | Leg 5 | 800 | 202] 1.5 [DL + RSX] | 5835.4694 | -661.8808 | 18.4 | 5 |
| Botttom–Right | Leg 5 | 800 | 202] 1.5 [DL + RSX] | 5835.4694 | 642.7965 | 18.27 | 5 |
| Bottom–Left | Leg 6 | 1000 | 202] 1.5 [DL + RSX] | 8916.7234 | -154.3039 | 18.57 | 5 |
| Botttom–Right | Leg 6 | 1100 | 202] 1.5 [DL + RSX] | 8916.7234 | 261.4394 | 19.09 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1333.8014 | -10.1838 | 18.58 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1333.8014 | 10.341 | 18.61 | 5 |
| Bottom–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2422.7763 | -1.1312 | 15.2 | 5 |
| Botttom–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1642.5303 | 48.5135 | 12.54 | 5 |
| Bottom–Left | Leg 9 | 1100 | 203] 1.5 [DL + RSY] | 7475.9075 | -3566.5489 | 14.97 | 5 |
| Botttom–Right | Leg 9 | 1100 | 203] 1.5 [DL + RSY] | 7475.9075 | 3784.9044 | 15.34 | 5 |
| Bottom–Left | Leg 10 | 800 | 202] 1.5 [DL + RSX] | 6047.311 | -662.3943 | 18.9 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 800 | 202] 1.5 [DL + RSX] | 6047.311 | 625.5966 | 18.65 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1545.2539 | -7.491 | 20.72 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1545.2539 | 4.5902 | 20.18 | 5 |
| Bottom–Left | Leg 12 | 800 | 202] 1.5 [DL + RSX] | 5829.1247 | -647.2618 | 18.28 | 5 |
| Botttom–Right | Leg 12 | 800 | 202] 1.5 [DL + RSX] | 5829.1247 | 656.3069 | 18.34 | 5 |
| Bottom–Left | Leg 13 | 1000 | 202] 1.5 [DL + RSX] | 8894.8291 | -154.1606 | 18.53 | 5 |
| Botttom–Right | Leg 13 | 1100 | 202] 1.5 [DL + RSX] | 8894.8291 | 261.9053 | 19.05 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1330.0043 | -9.9898 | 18.5 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1330.0043 | 10.1673 | 18.53 | 5 |
| Bottom–Left | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 3103.2474 | -628.987 | 11.67 | 5 |
| Botttom–Right | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 3103.2474 | 622.415 | 11.62 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| GF(+0.25) | P37 | 13660.1 | 15806.1 | 6300 | 869.8 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Top | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Top | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Top | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Top | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Top | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Top | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Top | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Top | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Top | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Top | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Top | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Top | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Top | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Top | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |
| Bottom | Leg 1 | 10520 | 17390 | 10520 | 17790 | 400 | 200 |
| Bottom | Leg 2 | 10520 | 17790 | 12920 | 17790 | 2400 | 200 |
| Bottom | Leg 3 | 12620 | 13590 | 12620 | 17790 | 4200 | 200 |
| Bottom | Leg 4 | 12220 | 13590 | 13020 | 13590 | 800 | 200 |
| Bottom | Leg 5 | 10520 | 15690 | 12620 | 15690 | 2100 | 200 |
| Bottom | Leg 6 | 10520 | 13590 | 10520 | 16090 | 2500 | 200 |
| Bottom | Leg 7 | 10520 | 13590 | 10920 | 13590 | 400 | 200 |
| Bottom | Leg 8 | 14320 | 13590 | 15120 | 13590 | 800 | 200 |
| Bottom | Leg 9 | 14720 | 13590 | 14720 | 17790 | 4200 | 200 |
| Bottom | Leg 10 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 11 | 16820 | 17390 | 16820 | 17790 | 400 | 200 |
| Bottom | Leg 12 | 14720 | 15690 | 16820 | 15690 | 2100 | 200 |
| Bottom | Leg 13 | 16820 | 13590 | 16820 | 16090 | 2500 | 200 |
| Bottom | Leg 14 | 16420 | 13590 | 16820 | 13590 | 400 | 200 |
| Bottom | Leg 15 | 12620 | 16405 | 14720 | 16405 | 2100 | 200 |

**Flexural Design for P, $M_3$ and $M_2$**

| Station | D/C | Flexural | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m |
|---|---|---|---|---|---|
| Top | 0.666 | 202] 1.5 [DL + RSX] | 40658.5031 | 842.833 | 75640.6404 |
| Bottom | 0.745 | 202] 1.5 [DL + RSX] | 41484.3692 | 684.3834 | 89769.412 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -231.9253 | 5.4044 | 29.3023 | 17.5823 | 75.3215 |
| Top | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 494.6755 | 924.353 | -374.6544 | 280.1922 | 626.6269 |
| Top | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4768.6969 | 3637.4008 | -531.8401 | 654.5562 | 1260.8171 |
| Top | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 728.5268 | 15.8095 | -28.9244 | 43.1106 | 158.5888 |
| Top | Leg 5 | 890.51 | 206] [0.9 DL + 1.5 RSX] | -917.4364 | 464.6317 | 758.0683 | 218.1854 | 758.0683 |
| Top | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -1456.2172 | 223.0341 | -240.2769 | 259.7445 | 620.6141 |
| Top | Leg 7 | 500 | 202] 1.5 [DL + RSX] | -213.1974 | 6.4671 | -69.0209 | 17.5823 | 75.3215 |
| Top | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 706.5512 | 10.3878 | 28.1378 | 43.1106 | 158.5888 |
| Top | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4797.848 | 3714.2036 | -529.0364 | 654.5562 | 1260.8171 |
| Top | Leg 10 | 500 | 202] 1.5 [DL + RSX] | 133.5956 | 581.5186 | 311.4191 | 226.5136 | 529.644 |
| Top | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -247.0973 | 5.0767 | 28.1288 | 17.5823 | 75.3215 |
| Top | Leg 12 | 887.81 | 206] [0.9 DL + 1.5 RSX] | -965.0088 | 475.9815 | -756.427 | 218.1854 | 756.427 |
| Top | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -1551.6451 | 221.7194 | -242.4923 | 259.7445 | 620.6141 |
| Top | Leg 14 | 500 | 202] 1.5 [DL + RSX] | -230.3642 | 2.5719 | 69.0565 | 17.5823 | 75.3215 |
| Top | Leg 15 | OS | 204] 1.2 [DL + LL + RSX] | 2892.2392 | 251.0207 | 1139.4032 | 240.975 | 544.1054 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | -592.1399 | 2.8137 | -62.2199 | 17.5823 | 75.3215 |
| Bottom | Leg 2 | 500 | 202] 1.5 [DL + RSX] | 267.5483 | 1564.739 | -394.7954 | 266.0333 | 612.4681 |
| Bottom | Leg 3 | 500 | 203] 1.5 [DL + RSY] | 4913.1511 | 4330.5698 | -515.8353 | 654.5562 | 1260.8171 |
| Bottom | Leg 4 | 500 | 202] 1.5 [DL + RSX] | 778.1787 | 73.4936 | 13.4042 | 43.1106 | 158.5888 |
| Bottom | Leg 5 | 755.86 | 202] 1.5 [DL + RSX] | 37.8483 | 886.3751 | -678.7933 | 220.5448 | 678.7933 |
| Bottom | Leg 6 | 500 | 202] 1.5 [DL + RSX] | -2382.3324 | 366.3876 | 220.7112 | 259.7445 | 620.6141 |
| Bottom | Leg 7 | 500 | 202] 1.5 [DL + RSX] | -225.028 | 14.852 | 41.3634 | 17.5823 | 75.3215 |
| Bottom | Leg 8 | 500 | 202] 1.5 [DL + RSX] | 752.8413 | 70.7608 | -13.3799 | 43.1106 | 158.5888 |
| Bottom | Leg 9 | 500 | 203] 1.5 [DL + RSY] | 4971.901 | 4481.8642 | -495.4993 | 654.5562 | 1260.8171 |
| Bottom | Leg 10 | 500 | 202] 1.5 [DL + RSX] | -191.6917 | 1016.6064 | 399.3708 | 218.1854 | 521.3158 |
| Bottom | Leg 11 | 500 | 202] 1.5 [DL + RSX] | -603.5109 | 2.5271 | -61.7017 | 17.5823 | 75.3215 |
| Bottom | Leg 12 | 763.52 | 202] 1.5 [DL + RSX] | -18.6785 | 922.7571 | 681.0748 | 218.1854 | 681.0748 |
| Bottom | Leg 13 | 500 | 202] 1.5 [DL + RSX] | -2476.1856 | 362.846 | 219.3445 | 259.7445 | 620.6141 |
| Bottom | Leg 14 | 500 | 202] 1.5 [DL + RSX] | -241.235 | 13.8713 | -41.3836 | 17.5823 | 75.3215 |
| Bottom | Leg 15 | 1156.58 | 202] 1.5 [DL + RSX] | 3065.8826 | 792.3755 | -942.1623 | 240.975 | 942.1623 |

Number of legs where shear force exceeds max allowed (top, bottom) = 1, 0

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1485.1708 | -4.0003 | 19.31 | 5 |
| Top–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1485.1708 | 5.4044 | 19.58 | 5 |
| Top–Left | Leg 2 | 900 | 202] 1.5 [DL + RSX] | 6786.3793 | -822.9578 | 18.42 | 5 |
| Top–Right | Leg 2 | 900 | 202] 1.5 [DL + RSX] | 6786.3793 | 924.353 | 18.95 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 3 | 1100 | 203] 1.5 [DL + RSY] | 7543.2632 | -3465.5431 | 14.87 | 5 |
| Top–Right | Leg 3 | 1100 | 203] 1.5 [DL + RSY] | 7543.2632 | 3637.4008 | 15.17 | 5 |
| Top–Left | Leg 4 | 200 | 202] 1.5 [DL + RSX] | 1688.4571 | -10.4544 | 11.04 | 5 |
| Top–Right | Leg 4 | 300 | 202] 1.5 [DL + RSX] | 2476.6517 | 3.626 | 15.65 | 5 |
| Top–Left | Leg 5 | 800 | 202] 1.5 [DL + RSX] | 5856.2995 | -484.1336 | 17.24 | 5 |
| Top–Right | Leg 5 | 800 | 202] 1.5 [DL + RSX] | 5856.2995 | 459.7563 | 17.07 | 5 |
| Top–Left | Leg 6 | 1000 | 202] 1.5 [DL + RSX] | 8929.8818 | -168.5112 | 18.67 | 5 |
| Top–Right | Leg 6 | 1100 | 202] 1.5 [DL + RSX] | 8929.8818 | 223.0341 | 18.93 | 5 |
| Top–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1428.244 | -2.5393 | 18.33 | 5 |
| Top–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1428.244 | 6.4671 | 19.07 | 5 |
| Top–Left | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 2465.7221 | -1.878 | 15.5 | 5 |
| Top–Right | Leg 8 | 200 | 203] 1.5 [DL + RSY] | 1694.7563 | 10.3878 | 11.08 | 5 |
| Top–Left | Leg 9 | 1100 | 203] 1.5 [DL + RSY] | 7505.413 | -3428.0116 | 14.76 | 5 |
| Top–Right | Leg 9 | 1100 | 203] 1.5 [DL + RSY] | 7505.413 | 3714.2036 | 15.25 | 5 |
| Top–Left | Leg 10 | 800 | 202] 1.5 [DL + RSX] | 6133.2733 | -633.7759 | 18.91 | 5 |
| Top–Right | Leg 10 | 800 | 202] 1.5 [DL + RSX] | 6133.2733 | 581.5186 | 18.56 | 5 |
| Top–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1479.0464 | -3.9575 | 19.23 | 5 |
| Top–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1479.0464 | 5.0767 | 19.44 | 5 |
| Top–Left | Leg 12 | 800 | 202] 1.5 [DL + RSX] | 5850.3569 | -465.7773 | 17.1 | 5 |
| Top–Right | Leg 12 | 800 | 202] 1.5 [DL + RSX] | 5850.3569 | 478.5326 | 17.18 | 5 |
| Top–Left | Leg 13 | 1000 | 202] 1.5 [DL + RSX] | 8905.7012 | -164.5315 | 18.6 | 5 |
| Top–Right | Leg 13 | 1100 | 202] 1.5 [DL + RSX] | 8905.7012 | 221.7194 | 18.88 | 5 |
| Top–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1425.4637 | -6.7568 | 19.09 | 5 |
| Top–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1425.4637 | 2.5719 | 18.3 | 5 |
| Top–Left | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3409.7428 | -5.8353 | 8.16 | 5 |
| Top–Right | Leg 15 | 400 | 203] 1.5 [DL + RSY] | 3409.7428 | 2.9284 | 8.14 | 5 |
| Bottom–Left | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1866.6334 | -1.7295 | 23.66 | 5 |
| Botttom–Right | Leg 1 | 200 | 202] 1.5 [DL + RSX] | 1866.6334 | 2.8137 | 23.86 | 5 |
| Bottom–Left | Leg 2 | 1000 | 202] 1.5 [DL + RSX] | 7195.4053 | -1454.1256 | 22.56 | 5 |
| Botttom–Right | Leg 2 | 1100 | 202] 1.5 [DL + RSX] | 7195.4053 | 1564.739 | 23.14 | 5 |
| Bottom–Left | Leg 3 | 1200 | 203] 1.5 [DL + RSY] | 7738.7918 | -4222.3628 | 16.39 | 5 |
| Botttom–Right | Leg 3 | 1200 | 203] 1.5 [DL + RSY] | 7738.7918 | 4330.5698 | 16.58 | 5 |
| Bottom–Left | Leg 4 | 300 | 207] [0.9 DL + 1.5 RSY] | 2299.7728 | -0.2399 | 14.38 | 5 |
| Botttom–Right | Leg 4 | 400 | 207] [0.9 DL + 1.5 RSY] | 2812.5757 | 2.1081 | 17.68 | 5 |
| Bottom–Left | Leg 5 | 900 | 202] 1.5 [DL + RSX] | 6141.8823 | -926.7373 | 20.93 | 5 |
| Botttom–Right | Leg 5 | 900 | 202] 1.5 [DL + RSX] | 6141.8823 | 886.3751 | 20.65 | 5 |
| Bottom–Left | Leg 6 | 1200 | 202] 1.5 [DL + RSX] | 9982.8735 | -211.8323 | 20.98 | 5 |
| Botttom–Right | Leg 6 | 1200 | 202] 1.5 [DL + RSX] | 9982.8735 | 366.3876 | 21.72 | 5 |
| Bottom–Left | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1475.3699 | -13.91 | 21.05 | 5 |
| Botttom–Right | Leg 7 | 200 | 202] 1.5 [DL + RSX] | 1475.3699 | 14.852 | 21.23 | 5 |
| Bottom–Left | Leg 8 | 400 | 203] 1.5 [DL + RSY] | 2799.5345 | -0.6446 | 17.53 | 5 |
| Botttom–Right | Leg 8 | 300 | 203] 1.5 [DL + RSY] | 1791.6843 | 70.7608 | 14.51 | 5 |
| Bottom–Left | Leg 9 | 1200 | 203] 1.5 [DL + RSY] | 7677.7528 | -4211.0013 | 16.3 | 5 |
| Botttom–Right | Leg 9 | 1200 | 203] 1.5 [DL + RSY] | 7677.7528 | 4481.8642 | 16.76 | 5 |
| Bottom–Left | Leg 10 | 900 | 202] 1.5 [DL + RSX] | 6611.6279 | -1064.9484 | 22.99 | 5 |

**Boundary Element Check (continued)**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Botttom–Right | Leg 10 | 900 | 202] 1.5 [DL + RSX] | 6611.6279 | 1016.6064 | 22.66 | 5 |
| Bottom–Left | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1857.4721 | -2.0335 | 23.6 | 5 |
| Botttom–Right | Leg 11 | 200 | 202] 1.5 [DL + RSX] | 1857.4721 | 2.5271 | 23.69 | 5 |
| Bottom–Left | Leg 12 | 900 | 202] 1.5 [DL + RSX] | 6132.9627 | -891.4392 | 20.67 | 5 |
| Botttom–Right | Leg 12 | 900 | 202] 1.5 [DL + RSX] | 6132.9627 | 922.7571 | 20.88 | 5 |
| Bottom–Left | Leg 13 | 1200 | 202] 1.5 [DL + RSX] | 9961.6284 | -211.4659 | 20.94 | 5 |
| Botttom–Right | Leg 13 | 1200 | 202] 1.5 [DL + RSX] | 9961.6284 | 362.846 | 21.66 | 5 |
| Bottom–Left | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1474.2713 | -14.8894 | 21.22 | 5 |
| Botttom–Right | Leg 14 | 200 | 202] 1.5 [DL + RSX] | 1474.2713 | 13.8713 | 21.03 | 5 |
| Bottom–Left | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 3083.0173 | -797.8561 | 12.77 | 5 |
| Botttom–Right | Leg 15 | 500 | 202] 1.5 [DL + RSX] | 3083.0173 | 792.3755 | 12.73 | 5 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| HELIPAD(+96.92) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 2263 | 0.0054 | 0.0024 | 207] [0.9 DL + 1.5 RSY] | 2.7054 | -71.6176 | 46.9555 | 420000 |
| Bottom | 2410 | 0.0057 | 0.0024 | 203] 1.5 [DL + RSY] | 148.783 | 79.7523 | -154.5812 | 420000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 67.1953 | 193.9459 | -117.3012 | 129.7621 | 432.8926 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 136.0025 | 119.1758 | -122.4001 | 135.0063 | 438.1368 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 385.2498 | -189.1443 | 2.2 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 385.2498 | 65.1204 | 1.36 | 6 |
| Bottom–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 440.2956 | -306.3157 | 3.13 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 440.2956 | 86.3948 | 1.64 | 6 |

# ETABS Shear Wall Design

IS 456:2000 Pier Design

**Pier Details**

| Story ID | Pier ID | Centroid X (mm) | Centroid Y (mm) | Length (mm) | Thickness (mm) | LLRF |
|---|---|---|---|---|---|---|
| MR ROOF(+92.55) | P38 | 15770 | 17790 | 2100 | 200 | 1 |

**Material Properties**

| $E_c$ (MPa) | $f_{ck}$ (MPa) | Lt.Wt Factor (Unitless) | $f_y$ (MPa) | $f_{ys}$ (MPa) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |

**Design Code Parameters**

| $\Gamma_S$ | $\Gamma_C$ | $IP_{MAX}$ | $IP_{MIN}$ | $P_{MAX}$ | MinEcc Major | MinEcc Minor |
|---|---|---|---|---|---|---|
| 1.15 | 1.5 | 0.04 | 0.0025 | 0.8 | No | No |

**Pier Leg Location, Length and Thickness**

| Station Location | ID | Left $X_1$ mm | Left $Y_1$ mm | Right $X_2$ mm | Right $Y_2$ mm | Length mm | Thickness mm |
|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |
| Bottom | Leg 1 | 14720 | 17790 | 16820 | 17790 | 2100 | 200 |

**Flexural Design for $P_u$, $M_{u2}$ and $M_{u3}$**

| Station Location | Required Rebar Area (mm²) | Required Reinf Ratio | Current Reinf Ratio | Flexural Combo | $P_u$ kN | $M_{u2}$ kN-m | $M_{u3}$ kN-m | Pier $A_g$ mm² |
|---|---|---|---|---|---|---|---|---|
| Top | 2073 | 0.0049 | 0.0024 | 207] [0.9 DL + 1.5 RSY] | 191.2568 | -75.2867 | 112.4103 | 420000 |
| Bottom | 1898 | 0.0045 | 0.0024 | 207] [0.9 DL + 1.5 RSY] | 219.126 | -65.4384 | -221.2825 | 420000 |

**Shear Design**

| Station Location | ID | Rebar mm²/m | Shear Combo | $P_u$ kN | $M_u$ kN-m | $V_u$ kN | $V_c$ kN | $V_c + V_s$ kN |
|---|---|---|---|---|---|---|---|---|
| Top | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 475.9871 | 307.2332 | -308.319 | 137.4308 | 440.5612 |
| Bottom | Leg 1 | 500 | 202] 1.5 [DL + RSX] | 522.4359 | 256.8153 | -310.2392 | 132.5301 | 435.6605 |

**Boundary Element Check**

| Station Location | ID | Edge Length (mm) | Governing Combo | $P_u$ kN | $M_u$ kN-m | Stress Comp MPa | Stress Limit MPa |
|---|---|---|---|---|---|---|---|
| Top–Left | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1015.3185 | -7.8858 | 2.47 | 6 |
| Top–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1015.3185 | 270.6343 | 4.26 | 6 |
| Bottom–Left | Leg 1 | 200 | 204] 1.2 [DL + LL + RSX] | 1052.4776 | -764.9152 | 7.71 | 6 |
| Botttom–Right | Leg 1 | 0 | 204] 1.2 [DL + LL + RSX] | 1052.4776 | 162.0902 | 3.61 | 6 |

## TOWER C-WITHOUT DISTRESS BVIL ETABS MODEL-D/C RATIO

**Annexure 9**

| SL.No: | ETABS Element ID | Result | Load Case | Floor Level | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Base-GF | GF-1F | 1F-2F | 2F-3F | 3F-4F | 4F-5F | 5F-6F | 6F-7F | 7F-8F | 8F-9F | 9F-10F | 10F-11F | 11F-12F | 12F-13F | 13F-14F | 14F-15F | 15F-16F | 16F-17F | 17F-18F | 18F-19F | 19F-20F | 20F-21F | 21F-22F | 22F-23F | 23F-24F | 24F-25F | 25F-26F |
| 1 | **C1** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **C2** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | **C3** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **C4** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **C5** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | **C6** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **C7** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | **C8** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **C9** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **C10** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | **C11** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **C12** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 1 | **S1** | D/C | Gravity | 1.06 | 1.025 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **S2** | D/C | Gravity | 1.142 | 1.139 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | **S3** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **S4** | D/C | Gravity | 1.046 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **S5** | D/C | Gravity | 1.138 | 1.135 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | **S6** | D/C | Gravity | 1.078 | 1.07 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **S7** | D/C | Gravity | 1.12 | 1.147 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | **S8** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **S9** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **S10** | D/C | Gravity | 1.162 | 1.079 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | **S11** | D/C | Gravity | 1.3 | 1.236 | 1.061 | 1.013 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **S12** | D/C | Gravity | 1.509 | 1.462 | 1.234 | 1.166 | 1.111 | 1.056 | 1.003 | ✓ | ✓ | ✓ | ✓ | 1.023 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 13 | **S13** | D/C | Gravity | 1.46 | 1.379 | 1.207 | 1.142 | 1.086 | 1.031 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 14 | **S14** | D/C | Gravity | 1.341 | 1.306 | 1.047 | 1.001 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | **S15** | D/C | Gravity | 1.15 | 1.129 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.024 | ✓ | ✓ | ✓ | ✓ |
| 16 | **S16** | D/C | Gravity | 1.118 | 1.089 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17 | **S17** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18 | **S18** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19 | **S19** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 20 | **S20** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 21 | **S21** | D/C | Gravity | 1.079 | 1.056 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 22 | **S22** | D/C | Gravity | 1.056 | 1.047 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 23 | **S23** | D/C | Gravity | 1.254 | 1.274 | 1.014 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 24 | **S24** | D/C | Gravity | 1.49 | 1.357 | 1.194 | 1.13 | 1.074 | 1.019 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 25 | **S25** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 26 | **S26** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 27 | **S27** | D/C | Gravity | 1.447 | 1.369 | 1.199 | 1.135 | 1.08 | 1.026 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 28 | **S28** | D/C | Gravity | 1.302 | 1.184 | 1.012 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 29 | **S29** | D/C | Gravity | 1.112 | 1.154 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 30 | **S30** | D/C | Gravity | 1.154 | 1.057 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 31 | **S31** | D/C | Gravity | 1.067 | 1.088 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 32 | **S32** | D/C | Gravity | 1.106 | 1.143 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 33 | **S33** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 34 | **S34** | D/C | Gravity | 1.044 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 35 | **S35** | D/C | Gravity | 1.09 | 1.126 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 36 | **S36** | D/C | Gravity | 1.074 | 1.062 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 37 | **S37** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| TOWER C-WITHOUT DISTRESS BVIL ETABS MODEL-D/C RATIO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Annexure 10 |
| SL.No: | ETABS Element ID | Result | Load Case | Floor Level | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Base-GF | GF-1F | 1F-2F | 2F-3F | 3F-4F | 4F-5F | 5F-6F | 6F-7F | 7F-8F | 8F-9F | 9F-10F | 10F-11F | 11F-12F | 12F-13F | 13F-14F | 14F-15F | 15F-16F | 16F-17F | 17F-18F | 18F-19F | 19F-20F | 20F-21F | 21F-22F | 22F-23F | 23F-24F | 24F-25F | 25F-26F |
| 1 | **C1** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **C2** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | **C3** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **C4** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **C5** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | **C6** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **C7** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | **C8** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **C9** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **C10** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | **C11** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **C12** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 1 | **S1** | D/C | Lateral | 1.171 | 1.166 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **S2** | D/C | Lateral | 1.184 | 1.134 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | **S3** | D/C | Lateral | 1.083 | 1.095 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **S4** | D/C | Lateral | 1.108 | 1.058 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **S5** | D/C | Lateral | 1.182 | 1.133 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | **S6** | D/C | Lateral | 1.172 | 1.173 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **S7** | D/C | Lateral | 1.188 | 1.176 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | **S8** | D/C | Lateral | 1.336 | 1.189 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **S9** | D/C | Lateral | 1.252 | 1.21 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **S10** | D/C | Lateral | 1.197 | 1.157 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | **S11** | D/C | Lateral | 1.425 | 1.414 | 1.131 | 1.066 | 1.034 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.01 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **S12** | D/C | Lateral | 1.469 | 1.461 | 1.211 | 1.155 | 1.12 | 1.083 | 1.048 | 1.013 | ✓ | ✓ | ✓ | ✓ | 1.151 | 1.073 | 1.018 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 13 | **S13** | D/C | Lateral | 1.431 | 1.417 | 1.185 | 1.131 | 1.096 | 1.059 | 1.024 | ✓ | ✓ | ✓ | 1.076 | 1.115 | 1.037 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 14 | **S14** | D/C | Lateral | 1.431 | 1.397 | 1.114 | 1.053 | 1.02 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | **S15** | D/C | Lateral | 1.2 | 1.221 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.035 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.261 | 2.132 | ✓ | ✓ | ✓ | ✓ |
| 16 | **S16** | D/C | Lateral | 1.162 | 1.177 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.032 | 1.42 | 2.217 | ✓ | ✓ | ✓ | ✓ |
| 17 | **S17** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18 | **S18** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19 | **S19** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 20 | **S20** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 21 | **S21** | D/C | Lateral | 1.218 | 1.235 | 1.003 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.09 | 1.048 | ✓ | ✓ | ✓ | ✓ | 1.056 | 1.272 | 1.347 | 1.253 | 1.32 | 1.92 | 2.7 | ✓ | ✓ | ✓ | ✓ |
| 22 | **S22** | D/C | Lateral | 1.193 | 1.223 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.123 | 1.049 | ✓ | ✓ | ✓ | 1 | 1.07 | 1.284 | 1.354 | 1.255 | 1.316 | 1.9 | 2.657 | ✓ | ✓ | ✓ | ✓ |
| 23 | **S23** | D/C | Lateral | 1.427 | 1.414 | 1.126 | 1.064 | 1.031 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 24 | **S24** | D/C | Lateral | 1.44 | 1.428 | 1.188 | 1.138 | 1.104 | 1.068 | 1.033 | ✓ | ✓ | ✓ | 1.093 | 1.131 | 1.053 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.065 | ✓ | ✓ | ✓ | ✓ |
| 25 | **S25** | D/C | Lateral | 1.377 | 1.276 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.121 |
| 26 | **S26** | D/C | Lateral | 1.344 | 1.273 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.046 |
| 27 | **S27** | D/C | Lateral | 1.428 | 1.421 | 1.187 | 1.141 | 1.108 | 1.072 | 1.038 | 1.005 | ✓ | ✓ | 1.051 | 1.162 | 1.083 | 1.03 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.178 | ✓ | ✓ | ✓ | ✓ |
| 28 | **S28** | D/C | Lateral | 1.446 | 1.41 | 1.127 | 1.066 | 1.033 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 29 | **S29** | D/C | Lateral | 1.223 | 1.211 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 30 | **S30** | D/C | Lateral | 1.224 | 1.2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 31 | **S31** | D/C | Lateral | 1.197 | 1.196 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 32 | **S32** | D/C | Lateral | 1.204 | 1.141 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 33 | **S33** | D/C | Lateral | 1.136 | 1.151 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 34 | **S34** | D/C | Lateral | 1.169 | 1.163 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 35 | **S35** | D/C | Lateral | 1.203 | 1.137 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 36 | **S36** | D/C | Lateral | 1.161 | 1.165 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 37 | **S37** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

## TOWER C-WITH DISTRESS -DEMAND /CAPACITY RATIO

## ANNEXURE 11

| SL.No: | ETABS Element ID | Result | Load Case | Floor Level | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Base-GF | GF-1F | 1F-2F | 2F-3F | 3F-4F | 4F-5F | 5F-6F | 6F-7F | 7F-8F | 8F-9F | 9F-10F | 10F-11F | 11F-12F | 12F-13F | 13F-14F | 14F-15F | 15F-16F | 16F-17F | 17F-18F | 18F-19F | 19F-20F | 20F-21F | 21F-22F | 22F-23F | 23F-24F | 24F-25F | 25F-26F |
| 1 | **C1** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **C2** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | **C3** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **C4** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **C5** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | **C6** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **C7** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | **C8** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **C9** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **C10** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | **C11** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **C12** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 1 | **S1** | D/C | Gravity | 1.829 | 1.773 | 1.533 | 1.449 | 1.407 | 1.351 | 1.294 | 1.241 | 1.193 | 1.148 | 1.313 | 1.203 | 1.116 | 1.267 | 1.194 | 1.092 | 1.021 | 1.008 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **S2** | D/C | Gravity | 2.02 | 2.057 | 1.63 | 1.553 | 1.487 | 1.42 | 1.354 | 1.289 | 1.225 | 1.173 | 1.122 | 1.558 | 1.465 | 1.407 | 1.322 | 1.291 | 1.21 | 1.163 | 1.088 | 1.046 | 1.006 | ✓ | 1.621 | ✓ | ✓ | ✓ | ✓ |
| 3 | **S3** | D/C | Gravity | 1.712 | 1.815 | 1.277 | 1.278 | 1.221 | 1.177 | 1.128 | 1.087 | 1.05 | ✓ | 1.218 | 1.035 | ✓ | 1.119 | 1.053 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **S4** | D/C | Gravity | 1.885 | 1.592 | 1.272 | 1.274 | 1.217 | 1.173 | 1.124 | 1.086 | 1.05 | ✓ | 1.223 | 1.032 | ✓ | 1.115 | 1.051 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **S5** | D/C | Gravity | 2.016 | 2.052 | 1.625 | 1.549 | 1.482 | 1.415 | 1.349 | 1.284 | 1.22 | 1.166 | 1.326 | 1.549 | 1.464 | 1.406 | 1.325 | 1.294 | 1.213 | 1.167 | 1.096 | 1.055 | 1.01 | | 1.641 | ✓ | ✓ | ✓ | ✓ |
| 6 | **S6** | D/C | Gravity | 1.87 | 1.905 | 1.526 | 1.452 | 1.4 | 1.343 | 1.287 | 1.231 | 1.183 | 1.139 | 1.303 | 1.192 | 1.108 | 1.257 | 1.185 | 1.08 | 1.012 | 1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **S7** | D/C | Gravity | 1.908 | 2.031 | 1.603 | 1.547 | 1.491 | 1.435 | 1.379 | 1.322 | 1.272 | 1.233 | 1.429 | 1.691 | 1.537 | 1.44 | 1.365 | 1.319 | 1.236 | 1.171 | 1.097 | 1.05 | | | 1.264 | ✓ | ✓ | ✓ | ✓ |
| 8 | **S8** | D/C | Gravity | 1.801 | 1.669 | 1.33 | 1.295 | 1.258 | 1.234 | 1.194 | 1.154 | 1.113 | 1.081 | 1.042 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **S9** | D/C | Gravity | 1.649 | 1.72 | 1.293 | 1.259 | 1.223 | 1.199 | 1.159 | 1.119 | 1.078 | 1.046 | 1.006 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **S10** | D/C | Gravity | 2.031 | 1.849 | 1.596 | 1.54 | 1.484 | 1.428 | 1.372 | 1.316 | 1.262 | 1.224 | 1.415 | 1.678 | 1.53 | 1.438 | 1.358 | 1.312 | 1.229 | 1.162 | 1.088 | 1.04 | ✓ | ✓ | 1.207 | ✓ | ✓ | ✓ | ✓ |
| 11 | **S11** | D/C | Gravity | 2.241 | 2.376 | 1.755 | 1.672 | 1.613 | 1.55 | 1.495 | 1.444 | 1.391 | 1.339 | 1.295 | 1.596 | 1.449 | 1.421 | 1.344 | 1.225 | 1.155 | 1.159 | 1.082 | 1.017 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **S12** | D/C | Gravity | 2.732 | 2.696 | 2.122 | 2.007 | 1.918 | 1.827 | 1.741 | 1.656 | 1.574 | 1.494 | 1.423 | 1.812 | 1.705 | 1.618 | 1.525 | 1.437 | 1.351 | 1.276 | 1.206 | 1.216 | 1.145 | 1.076 | 1.098 | ✓ | ✓ | ✓ | ✓ |
| 13 | **S13** | D/C | Gravity | 2.608 | 2.481 | 2.06 | 1.95 | 1.861 | 1.77 | 1.682 | 1.597 | 1.513 | 1.431 | 1.523 | 1.729 | 1.609 | 1.504 | 1.421 | 1.333 | 1.255 | 1.178 | 1.103 | 1.097 | 1.02 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 14 | **S14** | D/C | Gravity | 2.359 | 2.116 | 1.731 | 1.653 | 1.593 | 1.529 | 1.469 | 1.417 | 1.363 | 1.307 | 1.469 | 1.562 | 1.415 | 1.382 | 1.304 | 1.184 | 1.113 | 1.111 | 1.033 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | **S15** | D/C | Gravity | 2.125 | 2.121 | 1.648 | 1.587 | 1.525 | 1.463 | 1.401 | 1.339 | 1.277 | 1.213 | 1.165 | 1.511 | 1.413 | 1.377 | 1.33 | 1.283 | 1.25 | 1.245 | 1.21 | 1.149 | 1.126 | 1.127 | 1.976 | ✓ | ✓ | ✓ | ✓ |
| 16 | **S16** | D/C | Gravity | 2.048 | 2.03 | 1.576 | 1.518 | 1.457 | 1.396 | 1.335 | 1.274 | 1.212 | 1.153 | 1.28 | 1.43 | 1.335 | 1.297 | 1.25 | 1.206 | 1.172 | 1.163 | 1.126 | 1.072 | 1.054 | 1.091 | 1.193 | ✓ | ✓ | ✓ | ✓ |
| 17 | **S17** | D/C | Gravity | 1.415 | 1.371 | 1.334 | 1.283 | 1.237 | 1.19 | 1.143 | 1.095 | 1.048 | ✓ | 1.015 | 1.109 | 1.042 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18 | **S18** | D/C | Gravity | 1.398 | 1.355 | 1.313 | 1.259 | 1.214 | 1.166 | 1.119 | 1.072 | 1.025 | ✓ | ✓ | ✓ | 1.079 | 1.009 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19 | **S19** | D/C | Gravity | 1.41 | 1.366 | 1.326 | 1.276 | 1.229 | 1.18 | 1.132 | 1.083 | 1.034 | ✓ | ✓ | 1.077 | 1.007 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 20 | **S20** | D/C | Gravity | 1.391 | 1.346 | 1.308 | 1.258 | 1.21 | 1.162 | 1.114 | 1.065 | 1.017 | ✓ | ✓ | 1.058 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 21 | **S21** | D/C | Gravity | 1.971 | 1.958 | 1.53 | 1.471 | 1.412 | 1.353 | 1.295 | 1.236 | 1.177 | 1.125 | 1.268 | 1.404 | 1.312 | 1.27 | 1.224 | 1.191 | 1.159 | 1.15 | 1.126 | 1.083 | 1.067 | 1.112 | 2.04 | ✓ | ✓ | ✓ | ✓ |
| 22 | **S22** | D/C | Gravity | 1.936 | 1.947 | 1.514 | 1.459 | 1.4 | 1.342 | 1.284 | 1.226 | 1.168 | 1.122 | 1.269 | 1.406 | 1.308 | 1.268 | 1.224 | 1.193 | 1.162 | 1.154 | 1.132 | 1.089 | 1.073 | 1.116 | 2.013 | ✓ | ✓ | ✓ | ✓ |
| 23 | **S23** | D/C | Gravity | 2.139 | 2.287 | 1.664 | 1.593 | 1.533 | 1.475 | 1.421 | 1.373 | 1.322 | 1.28 | 1.447 | 1.524 | 1.371 | 1.341 | 1.267 | 1.153 | 1.085 | 1.085 | 1.011 | | | | 1.033 | ✓ | ✓ | ✓ | ✓ |
| 24 | **S24** | D/C | Gravity | 2.697 | 2.44 | 2.04 | 1.935 | 1.844 | 1.754 | 1.666 | 1.581 | 1.497 | 1.415 | 1.34 | 1.708 | 1.592 | 1.501 | 1.404 | 1.311 | 1.222 | 1.145 | 1.069 | 1.062 | | | | ✓ | ✓ | ✓ | ✓ |
| 25 | **S25** | D/C | Gravity | 1.654 | 1.632 | 1.245 | 1.211 | 1.171 | 1.145 | 1.104 | 1.063 | 1.022 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 26 | **S26** | D/C | Gravity | 1.604 | 1.566 | 1.244 | 1.207 | 1.168 | 1.143 | 1.103 | 1.062 | 1.022 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 27 | **S27** | D/C | Gravity | 2.596 | 2.475 | 2.053 | 1.945 | 1.857 | 1.768 | 1.683 | 1.599 | 1.518 | 1.438 | 1.457 | 1.748 | 1.631 | 1.514 | 1.444 | 1.35 | 1.262 | 1.183 | 1.106 | 1.099 | 1.017 | ✓ | 1.024 | ✓ | ✓ | ✓ | ✓ |
| 28 | **S28** | D/C | Gravity | 2.282 | 2.033 | 1.671 | 1.59 | 1.533 | 1.472 | 1.418 | 1.37 | 1.327 | 1.278 | 1.445 | 1.517 | 1.364 | 1.331 | 1.255 | 1.14 | 1.071 | 1.069 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 29 | **S29** | D/C | Gravity | 1.87 | 2.098 | 1.566 | 1.531 | 1.471 | 1.417 | 1.361 | 1.306 | 1.261 | 1.223 | 1.168 | 1.674 | 1.519 | 1.434 | 1.355 | 1.31 | 1.228 | 1.168 | 1.095 | 1.049 | ✓ | ✓ | 1.251 | ✓ | ✓ | ✓ | ✓ |
| 30 | **S30** | D/C | Gravity | 2.032 | 1.817 | 1.569 | 1.52 | 1.463 | 1.409 | 1.354 | 1.298 | 1.254 | 1.217 | 1.407 | 1.664 | 1.505 | 1.42 | 1.342 | 1.297 | 1.216 | 1.154 | 1.082 | 1.036 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 31 | **S31** | D/C | Gravity | 1.846 | 1.951 | 1.538 | 1.472 | 1.417 | 1.36 | 1.3 | 1.237 | 1.202 | 1.149 | 1.317 | 1.208 | 1.124 | 1.276 | 1.203 | 1.1 | 1.028 | 1.015 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 32 | **S32** | D/C | Gravity | 1.912 | 2.105 | 1.609 | 1.544 | 1.476 | 1.411 | 1.347 | 1.268 | 1.22 | 1.163 | 1.335 | 1.562 | 1.475 | 1.418 | 1.341 | 1.312 | 1.233 | 1.189 | 1.128 | 1.09 | 1.063 | 1.01 | 1.841 | ✓ | ✓ | ✓ | ✓ |
| 33 | **S33** | D/C | Gravity | 1.754 | 1.627 | 1.281 | 1.271 | 1.212 | 1.168 | 1.12 | 1.082 | 1.04 | ✓ | 1.203 | 1.026 | ✓ | 1.111 | 1.046 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 34 | **S34** | D/C | Gravity | 1.854 | 1.801 | 1.306 | 1.291 | 1.23 | 1.187 | 1.137 | 1.098 | 1.057 | 1.003 | 1.217 | 1.042 | ✓ | 1.128 | 1.062 | 1.003 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 35 | **S35** | D/C | Gravity | 1.895 | 2.059 | 1.601 | 1.549 | 1.479 | 1.414 | 1.35 | 1.286 | 1.223 | 1.172 | 1.342 | 1.561 | 1.472 | 1.419 | 1.342 | 1.315 | 1.238 | 1.196 | 1.13 | 1.094 | 1.05 | 1 | 1.706 | ✓ | ✓ | ✓ | ✓ |
| 36 | **S36** | D/C | Gravity | 1.876 | 1.897 | 1.525 | 1.461 | 1.406 | 1.349 | 1.292 | 1.24 | 1.191 | 1.137 | 1.298 | 1.195 | 1.113 | 1.263 | 1.19 | 1.088 | 1.016 | 1.003 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 37 | **S37** | D/C | Gravity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| TOWER C-WITH DISTRESS -DEMAND /CAPACITY RATIO | | | | | | | | | | | | | | | | | | | | | | | | | | | | ANNEXURE 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SL.No: | ETABS Element ID | Result | Load Case | Floor Level | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Base-GF | GF-1F | 1F-2F | 2F-3F | 3F-4F | 4F-5F | 5F-6F | 6F-7F | 7F-8F | 8F-9F | 9F-10F | 10F-11F | 11F-12F | 12F-13F | 13F-14F | 14F-15F | 15F-16F | 16F-17F | 17F-18F | 18F-19F | 19F-20F | 20F-21F | 21F-22F | 22F-23F | 23F-24F | 24F-25F | 25F-26F |
| 1 | **C1** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **C2** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | **C3** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **C4** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **C5** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | **C6** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **C7** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | **C8** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | **C9** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10 | **C10** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | **C11** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | **C12** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 1 | **S1** | D/C | Lateral | 2.129 | 2.153 | 1.768 | 1.662 | 1.635 | 1.594 | 1.553 | 1.513 | 1.449 | 1.433 | 1.715 | 1.433 | 1.234 | 1.397 | 1.333 | 1.231 | 1.146 | 1.171 | 1.096 | 1.02 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | **S2** | D/C | Lateral | 2.235 | 2.129 | 1.639 | 1.565 | 1.502 | 1.445 | 1.39 | 1.334 | 1.28 | 1.23 | 1.412 | 1.642 | 1.542 | 1.486 | 1.406 | 1.374 | 1.29 | 1.256 | 1.19 | 1.153 | 1.142 | 1.149 | 2.22 | ✓ | ✓ | ✓ | ✓ |
| 3 | **S3** | D/C | Lateral | 2.031 | 2.11 | 1.52 | 1.529 | 1.477 | 1.442 | 1.411 | 1.377 | 1.341 | 1.287 | 1.676 | 1.287 | 1.116 | 1.323 | 1.251 | 1.185 | 1.116 | 1.048 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | **S4** | D/C | Lateral | 2.073 | 2.029 | 1.514 | 1.528 | 1.476 | 1.443 | 1.413 | 1.38 | 1.344 | 1.289 | 1.324 | 1.289 | 1.118 | 1.328 | 1.258 | 1.194 | 1.127 | 1.06 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | **S5** | D/C | Lateral | 2.232 | 2.125 | 1.634 | 1.558 | 1.498 | 1.441 | 1.385 | 1.329 | 1.272 | 1.222 | 1.405 | 1.631 | 1.547 | 1.49 | 1.409 | 1.378 | 1.293 | 1.265 | 1.2 | 1.169 | 1.164 | 1.17 | 2.239 | ✓ | ✓ | ✓ | ✓ |
| 6 | **S6** | D/C | Lateral | 2.127 | 2.188 | 1.76 | 1.655 | 1.627 | 1.584 | 1.544 | 1.503 | 1.464 | 1.422 | 1.704 | 1.42 | 1.223 | 1.385 | 1.319 | 1.218 | 1.131 | 1.156 | 1.081 | 1.004 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | **S7** | D/C | Lateral | 2.133 | 2.121 | 1.619 | 1.568 | 1.516 | 1.467 | 1.418 | 1.368 | 1.321 | 1.286 | 1.492 | 1.809 | 1.631 | 1.539 | 1.465 | 1.43 | 1.354 | 1.309 | 1.245 | 1.214 | 1.124 | 1.067 | 1.8 | ✓ | ✓ | ✓ | ✓ |
| 8 | **S8** | D/C | Lateral | 2.632 | 2.417 | 1.528 | 1.448 | 1.378 | 1.338 | 1.282 | 1.234 | 1.191 | 1.167 | 1.137 | 1.087 | 1.046 | 1.016 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.864 | 2.039 | 2.64 | 3.627 |
| 9 | **S9** | D/C | Lateral | 2.424 | 2.396 | 1.482 | 1.409 | 1.338 | 1.297 | 1.24 | 1.192 | 1.148 | 1.124 | 1..091 | 1.007 | 1.002 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 2.14 | 2.524 | 3.369 | 4.084 |
| 10 | **S10** | D/C | Lateral | 2.151 | 2.075 | 1.609 | 1.559 | 1.507 | 1.458 | 1.408 | 1.359 | 1.312 | 1.238 | 1.479 | 1.795 | 1.621 | 1.529 | 1.455 | 1.42 | 1.343 | 1.295 | 1.23 | 1.198 | 1.14 | 1.044 | 1.691 | ✓ | ✓ | ✓ | ✓ |
| 11 | **S11** | D/C | Lateral | 2.622 | 2.662 | 2.001 | 1.892 | 1.852 | 1.802 | 1.763 | 1.722 | 1.68 | 1.64 | 1.918 | 1.846 | 1.623 | 1.609 | 1.538 | 1.42 | 1.357 | 1.401 | 1.353 | 1.302 | 1.282 | 1.235 | 1.854 | ✓ | ✓ | ✓ | ✓ |
| 12 | **S12** | D/C | Lateral | 2.782 | 2.757 | 2.163 | 2.017 | 2.024 | 1.974 | 1.926 | 1.889 | 1.853 | 1.805 | 2.188 | 2.184 | 2.006 | 1.918 | 1.851 | 1.787 | 1.724 | 1.67 | 1.624 | 1.701 | 1.651 | 1.646 | 1.829 | ✓ | ✓ | ✓ | ✓ |
| 13 | **S13** | D/C | Lateral | 2.689 | 2.664 | 2.104 | 2.017 | 1.975 | 1.926 | 1.888 | 1.854 | 1.82 | 1.772 | 2.165 | 2.117 | 1.939 | 1.854 | 1.785 | 1.723 | 1.675 | 1.627 | 1.578 | 1.667 | 1.644 | 1.659 | 1.893 | ✓ | ✓ | ✓ | ✓ |
| 14 | **S14** | D/C | Lateral | 2.645 | 2.623 | 1.969 | 1.871 | 1.827 | 1.775 | 1.734 | 1.692 | 1.648 | 1.604 | 1.87 | 1.806 | 1.584 | 1.565 | 1.493 | 1.373 | 1.307 | 1.338 | 1.285 | 1.23 | 1.191 | 1.144 | 1.588 | ✓ | ✓ | ✓ | ✓ |
| 15 | **S15** | D/C | Lateral | 2.244 | 2.296 | 1.736 | 1.707 | 1.679 | 1.65 | 1.619 | 1.599 | 1.576 | 1.55 | 1.834 | 2.032 | 1.915 | 1.911 | 1.898 | 1.881 | 1.876 | 2.146 | 2.29 | 2.177 | 2.316 | 3.084 | 4.92 | ✓ | ✓ | ✓ | ✓ |
| 16 | **S16** | D/C | Lateral | 2.157 | 2.2 | 1.655 | 1.628 | 1.602 | 1.573 | 1.55 | 1.531 | 1.509 | 1.483 | 1.758 | 1.942 | 1.836 | 1.832 | 1.814 | 1.829 | 1.931 | 2.29 | 2.434 | 2.304 | 2.442 | 3.35 | 5.018 | ✓ | ✓ | ✓ | ✓ |
| 17 | **S17** | D/C | Lateral | 1.512 | 1.384 | 1.371 | 1.317 | 1.276 | 1.233 | 1.193 | 1.157 | 1.119 | 1.086 | 1.069 | 1.209 | 1.142 | 1.103 | 1.063 | 1.023 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.819 | ✓ | ✓ | ✓ | ✓ |
| 18 | **S18** | D/C | Lateral | 1.495 | 1.363 | 1.355 | 1.29 | 1.25 | 1.206 | 1.169 | 1.133 | 1.096 | 1.066 | 1.136 | 1.182 | 1.112 | 1.0731 | 1.032 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.183 | ✓ | ✓ | ✓ | ✓ |
| 19 | **S19** | D/C | Lateral | 1.502 | 1.369 | 1.352 | 1.299 | 1.257 | 1.214 | 1.177 | 1.138 | 1.097 | 1.054 | 1.034 | 1.171 | 1.097 | 1.054 | 1.01 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.412 | ✓ | ✓ | ✓ | ✓ |
| 20 | **S20** | D/C | Lateral | 1.484 | 1.343 | 1.329 | 1.278 | 1.235 | 1.195 | 1.158 | 1.118 | 1.077 | 1.037 | 1.01 | 1.148 | 1.071 | 1.028 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 1.338 | ✓ | ✓ | ✓ | ✓ |
| 21 | **S21** | D/C | Lateral | 2.272 | 2.317 | 1.747 | 1.722 | 1.696 | 1.668 | 1.653 | 1.634 | 1.611 | 1.557 | 2.286 | 2.079 | 1.999 | 2.141 | 2.298 | 2.438 | 2.567 | 2.998 | 3.125 | 2.903 | 3.025 | 4.245 | 6.197 | ✓ | ✓ | ✓ | ✓ |
| 22 | **S22** | D/C | Lateral | 2.219 | 2.86 | 1.739 | 1.713 | 1.689 | 1.664 | 1.651 | 1.634 | 1.612 | 1.586 | 2.341 | 2.091 | 2.039 | 2.185 | 2.335 | 2.467 | 2.588 | 3.012 | 3.129 | 2.897 | 3.008 | 4.196 | 6.098 | ✓ | ✓ | ✓ | ✓ |
| 23 | **S23** | D/C | Lateral | 2.602 | 2.652 | 1.977 | 1.876 | 1.835 | 1.79 | 1.751 | 1.709 | 1.666 | 1.632 | 1.92 | 1.808 | 1.584 | 1.566 | 1.5 | 1.37 | 1.316 | 1.361 | 1.308 | 1.254 | 1.234 | 1.18 | 1.822 | ✓ | ✓ | ✓ | ✓ |
| 24 | **S24** | D/C | Lateral | 2.711 | 2.681 | 2.112 | 2.033 | 1.993 | 1.944 | 1.91 | 1.876 | 1.84 | 1.797 | 2.207 | 2.154 | 1.974 | 1.884 | 1.82 | 1.766 | 1.718 | 1.669 | 1.618 | 1.717 | 1.765 | 1.871 | 2.137 | ✓ | ✓ | ✓ | ✓ |
| 25 | **S25** | D/C | Lateral | 4.008 | 3.049 | 1.703 | 1.572 | 1.499 | 1.459 | 1.398 | 1.342 | 1.288 | 1.253 | 1.207 | 1.15 | 1.108 | 1.114 | 1.198 | 1.335 | 1.561 | 1.787 | 1.985 | 2.19 | 2.355 | 2.795 | 3.335 | 5.078 | 5.334 | 6.027 | 6.542 |
| 26 | **S26** | D/C | Lateral | 3.918 | 3.016 | 1.704 | 1.568 | 1.498 | 1.459 | 1.399 | 1.344 | 1.292 | 1.259 | 1.216 | 1.158 | 1.118 | 1.203 | 1.285 | 1.419 | 1.641 | 1.87 | 2.07 | 2.235 | 2.435 | 2.861 | 3.379 | 4.926 | 5.182 | 5.812 | 6.149 |
| 27 | **S27** | D/C | Lateral | 2.68 | 2.675 | 2.113 | 2.038 | 1.999 | 1.953 | 1.92 | 1.886 | 1.855 | 1.8 | 2.101 | 2.21 | 2.018 | 1.937 | 1.867 | 1.816 | 1.767 | 1.717 | 1.665 | 1.766 | 1.808 | 1.914 | 2.309 | ✓ | ✓ | ✓ | ✓ |
| 28 | **S28** | D/C | Lateral | 2.645 | 2.626 | 1.975 | 1.876 | 1.834 | 1.787 | 1.747 | 1.705 | 1.661 | 1.629 | 1.915 | 1.801 | 1.576 | 1.55 | 1.484 | 1.363 | 1.297 | 1.331 | 1.277 | 1.219 | 1.185 | 1.127 | 1.681 | ✓ | ✓ | ✓ | ✓ |
| 29 | **S29** | D/C | Lateral | 2.168 | 2.186 | 1.623 | 1.584 | 1.529 | 1.48 | 1.429 | 1.379 | 1.33 | 1.299 | 1.5 | 1.817 | 1.646 | 1.559 | 1.482 | 1.447 | 1.382 | 1.339 | 1.276 | 1.247 | 1.214 | 1.122 | 1.923 | ✓ | ✓ | ✓ | ✓ |
| 30 | **S30** | D/C | Lateral | 2.197 | 2.095 | 1.624 | 1.584 | 1.53 | 1.481 | 1.431 | 1.381 | 1.335 | 1.305 | 1.508 | 1.822 | 1.649 | 1.561 | 1.483 | 1.45 | 1.387 | 1.344 | 1.28 | 1.253 | 1.225 | 1.113 | 1.956 | ✓ | ✓ | ✓ | ✓ |
| 31 | **S31** | D/C | Lateral | 2.176 | 2.218 | 1.804 | 1.711 | 1.69 | 1.654 | 1.619 | 1.581 | 1.545 | 1.508 | 1.831 | 1.49 | 1.281 | 1.454 | 1.386 | 1.285 | 1.219 | 1.231 | 1.156 | 1.089 | 1.026 | ✓ | 1.102 | ✓ | ✓ | ✓ | ✓ |
| 32 | **S32** | D/C | Lateral | 2.275 | 2.177 | 1.623 | 1.549 | 1.491 | 1.436 | 1.382 | 1.328 | 1.274 | 1.225 | 1.409 | 1.639 | 1.547 | 1.494 | 1.415 | 1.386 | 1.304 | 1.28 | 1.217 | 1.191 | 1.22 | 1.242 | 2.407 | ✓ | ✓ | ✓ | ✓ |
| 33 | **S33** | D/C | Lateral | 2.136 | 2.221 | 1.616 | 1.602 | 1.548 | 1.523 | 1.492 | 1.458 | 1.42 | 1.338 | 1.825 | 1.353 | 1.178 | 1.403 | 1.331 | 1.265 | 1.196 | 1.127 | 1.1 | 1.008 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 34 | **S34** | D/C | Lateral | 2.176 | 2.225 | 1.651 | 1.624 | 1.565 | 1.54 | 1.509 | 1.449 | 1.437 | 1.382 | 1.829 | 1.367 | 1.191 | 1.417 | 1.344 | 1.276 | 1.207 | 1.136 | 1.075 | 1.015 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 35 | **S35** | D/C | Lateral | 2.119 | 2.185 | 1.617 | 1.569 | 1.505 | 1.453 | 1.399 | 1.345 | 1.289 | 1.237 | 1.436 | 1.656 | 1.565 | 1.513 | 1.435 | 1.407 | 1.325 | 1.301 | 1.239 | 1.207 | 1.21 | 1.22 | 1.631 | ✓ | ✓ | ✓ | ✓ |
| 36 | **S36** | D/C | Lateral | 2.122 | 2.185 | 1.771 | 1.704 | 1.677 | 1.643 | 1.607 | 1.57 | 1.533 | 1.496 | 1.809 | 1.475 | 1.271 | 1.442 | 1.375 | 1.274 | 1.209 | 1.221 | 1.147 | 1.082 | ✓ | ✓ | 1.093 | ✓ | ✓ | ✓ | ✓ |
| 37 | **S37** | D/C | Lateral | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| Tower C-Beam reinforcement details-without distress-GF | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sheet no: ST-WD-REB.117C-017(Sheet 1) , ST-WD-REB.117C-010(Sheet 2) | | | | | | | | | | | | | | | | | | | | | | | | | | | Annexure 13-Sheet 01 of 02 | |
| Floor | Beam Detail | | | Bottom reinforcement | | | | | | | | | Top reinforcement | | | | | | | | Shear reinforcement | | | | | | | | |
| | | | | Left | | | Mid | | | RIGHT | | | Left | | | mid | | | right | | | left | | | mid | | | right | | |
| | Beam no. | size in mm | length (m) | Required | provided | Status | Required | provided | Status | Required | provided | Status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status |
| GF | FB62 | 200X500 | 3.845 | 345 | 942 | Ok | 298 | 942 | Ok | 300 | 942 | Ok | 466 | 942 | Ok | 231 | 942 | Ok | 355 | 628 | Ok | 563 | 1005 | Ok | 495 | 628 | Ok | 585 | 1005 | Ok |
| | FB63 | 200X500 | 2.665 | 310 | 942 | Ok | 310 | 942 | Ok | 621 | 942 | Ok | 310 | 942 | Ok | 516 | 1256 | Ok | 1242 | 1256 | Ok | 1432 | 1005 | Not Ok | 1630 | 1005 | Not Ok | 1764 | 1005 | Not Ok |
| | FB64 | 200X750 | 10.19 | 433 | 1256 | Ok | 1053 | 1256 | Ok | 434 | 1256 | Ok | 828 | 1256 | Ok | 363 | 942 | Ok | 828 | 1256 | Ok | 759 | 1571 | Ok | 520.82 | 981 | Ok | 757.58 | 1571 | Ok |
| | FB65 | 200X500 | 2.665 | 627 | 942 | Ok | 313 | 942 | Ok | 313 | 942 | Ok | 1254 | 1256 | Ok | 533 | 628 | Ok | 313 | 628 | Ok | 1774 | 1005 | Not Ok | 1640 | 1005 | Not Ok | 1441 | 1005 | Not Ok |
| | FB66 | 200X500 | 3.845 | 291 | 942 | Ok | 300 | 942 | Ok | 345 | 942 | Ok | 371 | 628 | Ok | 231 | 942 | Ok | 464 | 942 | Ok | 584.33 | 1005 | Ok | 489.11 | 628 | Ok | 559.7 | 1005 | Ok |
| | FB53 | 200X500 | 5.045 | 279 | 603 | Ok | 399 | 603 | Ok | 150 | 603 | Ok | 552 | 1030 | Ok | 150 | 402 | Ok | 565 | 1030 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 521.63 | 1005 | Ok |
| | FB54 | 200X500 | 3.53 | 321 | 603 | Ok | 327 | 603 | Ok | 443 | 603 | Ok | 799 | 1030 | Ok | 231 | 1030 | Ok | 231 | 1030 | Ok | 830 | 1005 | Ok | 581 | 1005 | Ok | 288 | 1005 | Ok |
| | FB55 | 200X500 | 3.73 | 418 | 603 | Ok | 367 | 603 | Ok | 358 | 603 | Ok | 231 | 1030 | Ok | 231 | 402 | Ok | 716 | 1030 | Ok | 265.55 | 1005 | Ok | 582.54 | 628 | Ok | 797.46 | 1005 | Ok |
| | FB58 | 200X500 | 3.53 | 593 | 603 | Ok | 405 | 603 | Ok | 346 | 603 | Ok | 231 | 1030 | Ok | 231 | 1030 | Ok | 899 | 1030 | Ok | 361 | 1005 | Ok | 675 | 1005 | Ok | 858 | 1005 | Ok |
| | FB59 | 200X500 | 5.045 | 150 | 603 | Ok | 391 | 603 | Ok | 291 | 603 | Ok | 644 | 1030 | Ok | 150 | 402 | Ok | 547 | 1030 | Ok | 585.73 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 1005 | Ok |
| | FB56 | 200X500 | 2.73 | 649 | 603 | Not Ok | 150 | 603 | Ok | 662 | 603 | Not Ok | 588 | 1030 | Ok | 309 | 1030 | Ok | 585 | 1030 | Ok | 509.37 | 1005 | Ok | 459.63 | 1005 | Ok | 520 | 1005 | Ok |
| | FB51 | 200X500 | 5.045 | 254 | 603 | Ok | 373 | 603 | Ok | 251 | 603 | Ok | 493 | 1030 | Ok | 231 | 402 | Ok | 501 | 1030 | Ok | 534 | 1005 | Ok | 462.67 | 628 | Ok | 522.47 | 1005 | Ok |
| | FB52 | 200X500 | 5.045 | 252 | 603 | Ok | 356 | 603 | Ok | 256 | 603 | Ok | 503 | 1030 | Ok | 231 | 402 | Ok | 476 | 1030 | Ok | 514 | 1005 | Ok | 444 | 628 | Ok | 517 | 1005 | Ok |
| | FB45 | 200X500 | 5.045 | 291 | 603 | Ok | 483 | 603 | Ok | 276 | 603 | Ok | 583 | 1030 | Ok | 231 | 402 | Ok | 553 | 1030 | Ok | 852.83 | 1005 | Ok | 568.28 | 628 | Ok | 765.82 | 1005 | Ok |
| | FB46 | 200X500 | 3.53 | 236 | 603 | Ok | 231 | 603 | Ok | 234 | 603 | Ok | 473 | 1030 | Ok | 231 | 402 | Ok | 469 | 1030 | Ok | 730.47 | 1005 | Ok | 542.74 | 1005 | Ok | 735.15 | 1005 | Ok |
| | FB47 | 200X500 | 3.73 | 240 | 603 | Ok | 271 | 603 | Ok | 309 | 603 | Ok | 480 | 1030 | Ok | 231 | 402 | Ok | 488 | 1030 | Ok | 766.52 | 1005 | Ok | 550.94 | 628 | Ok | 538.54 | 1005 | Ok |
| | FB44 | 200X500 | 2.73 | 240 | 603 | Ok | 231 | 603 | Ok | 251 | 603 | Ok | 420 | 603 | Ok | 231 | 603 | Ok | 403 | 603 | Ok | 575.36 | 1005 | Ok | 475.2 | 1005 | Ok | 580.75 | 1005 | Ok |
| | FB48 | 200X500 | 3.73 | 313 | 603 | Ok | 299 | 603 | Ok | 264 | 603 | Ok | 521 | 1030 | Ok | 237 | 402 | Ok | 528 | 1030 | Ok | 580 | 1005 | Ok | 530 | 628 | Ok | 872.81 | 1005 | Ok |
| | FB49 | 200X500 | 3.53 | 263 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 525 | 1030 | Ok | 231 | 402 | Ok | 455 | 1030 | Ok | 855.79 | 1005 | Ok | 577.88 | 1005 | Ok | 742.55 | 1005 | Ok |
| | FB50 | 200X500 | 5.045 | 277 | 603 | Ok | 474 | 603 | Ok | 303 | 603 | Ok | 554 | 1030 | Ok | 231 | 402 | Ok | 556 | 1030 | Ok | 746.23 | 1005 | Ok | 548.65 | 628 | Ok | 850.19 | 1005 | Ok |
| | FB37 | 200X500 | 3.53 | 233 | 804 | Ok | 249 | 804 | Ok | 150 | 804 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 221.63 | 503 | Ok | 221.69 | 503 | Ok | 221.69 | 838 | Ok |
| | FB38 | 200X500 | 1.945 | 231 | 1470 | Ok | 345 | 1470 | Ok | 477 | 1470 | Ok | 231 | 1470 | Ok | 453 | 1470 | Ok | 630 | 1470 | Ok | 725.54 | 1571 | Ok | 776.87 | 1571 | Ok | 786 | 1571 | Ok |
| | FB39 | 200X500 | 1.3 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 624 | 1571 | Ok | 604 | 1571 | Ok | 620 | 1571 | Ok |
| | FB40 | 200X500 | 1.3 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 625 | 1571 | Ok | 600 | 1571 | Ok | 626 | 1571 | Ok |
| | FB41 | 200X500 | 1.3 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 619 | 1571 | Ok | 605 | 1571 | Ok | 625 | 1571 | Ok |
| | FB42 | 200X500 | 1.945 | 475 | 1470 | Ok | 335 | 1470 | Ok | 231 | 1470 | Ok | 643 | 1470 | Ok | 461 | 1470 | Ok | 231 | 1470 | Ok | 792.26 | 1571 | Ok | 783.11 | 1571 | Ok | 727.74 | 1571 | Ok |
| | FB43 | 200X500 | 3.53 | 150 | 804 | Ok | 277 | 804 | Ok | 150 | 804 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 221.69 | 503 | Ok | 221.69 | 503 | Ok | 221.69 | 838 | Ok |
| | FB33 | 200X500 | 3.44 | 150 | 829 | Ok | 150 | 829 | Ok | 0 | 829 | Ok | 150 | 942 | Ok | 420 | 942 | Ok | 731 | 942 | Ok | 221.69 | 837.5 | Ok | 221.6 | 837.5 | Ok | 221.69 | 837.5 | Ok |
| | FB36 | 200X500 | 3.44 | 0 | 942 | Ok | 150 | 942 | Ok | 150 | 942 | Ok | 746 | 942 | Ok | 424 | 942 | Ok | 150 | 942 | Ok | 221.69 | 837.5 | Ok | 221.69 | 837.5 | Ok | 221.69 | 837.5 | Ok |
| | FB29 | 200X500 | 3.44 | 150 | 829 | Ok | 150 | 829 | Ok | 0 | 829 | Ok | 150 | 942 | Ok | 423 | 942 | Ok | 725 | 942 | Ok | 221.69 | 837.5 | Ok | 221.69 | 837.5 | Ok | 221.69 | 837.5 | Ok |
| | FB30 | 200X500 | 3.135 | 330 | 829 | Ok | 300 | 829 | Ok | 231 | 829 | Ok | 264 | 942 | Ok | 150 | 942 | Ok | 231 | 942 | Ok | 1342 | 837.5 | Not Ok | 221.69 | 837.5 | Ok | 732.36 | 837.5 | Ok |
| | FB31 | 200X500 | 3.135 | 231 | 829 | Ok | 264 | 829 | Ok | 328 | 829 | Ok | 231 | 942 | Ok | 231 | 942 | Ok | 250 | 942 | Ok | 744.31 | 837.5 | Ok | 963.64 | 837.5 | Not Ok | 1343.64 | 837.5 | Not Ok |
| | FB32 | 200X500 | 3.44 | 0 | 942 | Ok | 150 | 942 | Ok | 150 | 942 | Ok | 739 | 942 | Ok | 428 | 942 | Ok | 150 | 942 | Ok | 221.69 | 837.5 | Ok | 221.69 | 837.5 | Ok | 221.69 | 837.5 | Ok |
| | FB102 | 150X500 | 1.385 | 112 | 402 | Ok | 112 | 402 | Ok | 112 | 402 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 166.27 | 502 | Ok | 166.27 | 502 | Ok | 166.27 | 502 | Ok |
| | FB105 | 200X500 | 1.3 | 231 | 804 | Ok | 231 | 804 | Ok | 231 | 804 | Ok | 231 | 402 | Ok | 231 | 402 | Ok | 231 | 402 | Ok | 166.27 | 503 | Ok | 166.27 | 503 | Ok | 166.27 | 838 | Ok |
| | FB24 | 200X500 | 1.945 | 150 | 1470 | Ok | 353 | 1470 | Ok | 515 | 1470 | Ok | 150 | 2450 | Ok | 530 | 2450 | Ok | 742 | 2450 | Ok | 221.69 | 1005 | Ok | 395 | 1005 | Ok | 221.69 | 1005 | Ok |
| | FB25 | 200X500 | 1.8 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 2450 | Ok | 231 | 2450 | Ok | 231 | 2450 | Ok | 496 | 1005 | Ok | 500 | 1005 | Ok | 515.69 | 1005 | Ok |
| | FB26 | 200X500 | 1.945 | 489 | 1470 | Ok | 347 | 1470 | Ok | 150 | 1470 | Ok | 742 | 2450 | Ok | 549 | 2450 | Ok | 150 | 2450 | Ok | 221.69 | 1005 | Ok | 414.44 | 1005 | Ok | 221.69 | 1005 | Ok |
| | FB19 | 200X500 | 3.73 | 321 | 603 | Ok | 258 | 603 | Ok | 231 | 603 | Ok | 472 | 603 | Ok | 231 | 603 | Ok | 291 | 603 | Ok | 493.8 | 1005 | Ok | 435.79 | 628 | Ok | 478.93 | 1005 | Ok |
| | FB17 | 200X500 | 5.045 | 287 | 603 | Ok | 512 | 603 | Ok | 250 | 603 | Ok | 575 | 1030 | Ok | 231 | 402 | Ok | 500 | 1030 | Ok | 865.86 | 1030 | Ok | 569.7 | 402 | Not Ok | 762.08 | 804 | Ok |
| | FB18 | 200X500 | 3.53 | 262 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 525 | 1030 | Ok | 231 | 402 | Ok | 450 | 804 | Ok | 762.45 | 1005 | Ok | 571.2 | 628 | Ok | 622.52 | 1005 | Ok |
| | FB20 | 200X500 | 2.73 | 368 | 603 | Ok | 231 | 603 | Ok | 329 | 804 | Ok | 468 | 1030 | Ok | 231 | 1030 | Ok | 428 | 1030 | Ok | 625.77 | 1005 | Ok | 543.77 | 1005 | Ok | 655 | 1005 | Ok |
| | FB21 | 200X500 | 3.73 | 231 | 804 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 273 | 1030 | Ok | 231 | 602 | Ok | 392 | 1030 | Ok | 415.2 | 1005 | Ok | 432.76 | 628 | Ok | 565.54 | 1005 | Ok |
| | FB22 | 200X500 | 3.53 | 231 | 603 | Ok | 231 | 603 | Ok | 245 | 603 | Ok | 458 | 1030 | Ok | 231 | 602 | Ok | 490 | 1030 | Ok | 696.15 | 1005 | Ok | 545.53 | 628 | Ok | 733.08 | 1005 | Ok |
| | FB23 | 200X500 | 5.045 | 234 | 603 | Ok | 454 | 603 | Ok | 276 | 603 | Ok | 469 | 1030 | Ok | 231 | 602 | Ok | 550 | 1030 | Ok | 717.06 | 1005 | Ok | 514.57 | 628 | Ok | 820.43 | 1005 | Ok |
| | FB15 | 200X500 | 5.045 | 231 | 1256 | Ok | 536 | 1256 | Ok | 240 | 1256 | Ok | 444 | 603 | Ok | 231 | 603 | Ok | 479 | 603 | Ok | 619.95 | 1005 | Ok | 489 | 1005 | Ok | 600.96 | 1005 | Ok |
| | FB16 | 200X500 | 5.045 | 238 | 1256 | Ok | 386 | 1256 | Ok | 238 | 1256 | Ok | 476 | 603 | Ok | 231 | 603 | Ok | 425 | 603 | Ok | 527.47 | 1005 | Ok | 454.41 | 1005 | Ok | 531.62 | 1005 | Ok |
| | FB8 | 200X575 | 5.045 | 271 | 829 | Ok | 633 | 829 | Ok | 415 | 829 | Ok | 455 | 1030 | Ok | 271 | 602 | Ok | 271 | 1030 | Ok | 527.43 | 1005 | Ok | 444.24 | 628 | Ok | 708.96 | 1005 | Ok |
| | FB9 | 200X500 | 3.53 | 231 | 829 | Ok | 231 | 829 | Ok | 231 | 829 | Ok | 552 | 1030 | Ok | 299 | 1030 | Ok | 341 | 1030 | Ok | 508.34 | 1005 | Ok | 401.18 | 1005 | Ok | 626.17 | 1005 | Ok |
| | FB10 | 200X500 | 3.73 | 231 | 716 | Ok | 243 | 716 | Ok | 237 | 716 | Ok | 231 | 1030 | Ok | 231 | 602 | Ok | 475 | 1030 | Ok | 425 | 1005 | Ok | 354.5 | 628 | Ok | 536.46 | 1005 | Ok |
| | FB11 | 200X500 | 2.73 | 418 | 603 | Ok | 150 | 603 | Ok | 429 | 603 | Ok | 397 | 1030 | Ok | 170 | 1030 | Ok | 387 | 1030 | Ok | 255.5 | 1005 | Ok | 221.69 | 1005 | Ok | 257.16 | 1005 | Ok |
| | FB52 | 200X500 | 3.73 | 243 | 603 | Ok | 240 | 603 | Ok | 231 | 603 | Ok | 486 | 1030 | Ok | 231 | 602 | Ok | 231 | 1030 | Ok | 534.52 | 1005 | Ok | 351 | 628 | Ok | 423 | 1005 | Ok |
| | FB13 | 200X500 | 3.53 | 231 | 603 | Ok | 231 | 603 | Ok | 240 | 603 | Ok | 353 | 1030 | Ok | 231 | 1030 | Ok | 479 | 1030 | Ok | 598 | 1005 | Ok | 457 | 1005 | Ok | 516.68 | 1005 | Ok |
| | FB14 | 200X500 | 5.045 | 403 | 603 | Ok | 435 | 603 | Ok | 289 | 603 | Ok | 442 | 1030 | Ok | 231 | 602 | Ok | 577 | 1030 | Ok | 741 | 1005 | Ok | 422 | 628 | Ok | 572 | 1005 | Ok |

| Tower C-Beam reinforcement details-without distress-GF | | | | | | | | | | | | | Sheet no: ST-WD-REB.117C-017(Sheet 1) , ST-WD-REB.117C-010(Sheet 2) | | | | | | | | | Annexure 13-Sheet 02 of 02 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Floor | Beam Detail | | | Bottom reinforcement | | | | | | | | | Top reinforcement | | | | | | | | | Shear reinforcement | | | | | | | | |
| | | | | Left | | | Mid | | | RIGHT | | | Left | | | mid | | | right | | | left | | | mid | | | right | | |
| | Beam no. | size in mm | length (m) | Required | provided | Status | Required | provided | Status | Required | provided | Status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status |
| GF | FB1 | 200X575 | 3.845 | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 628 | Ok | 454.27 | 1005 | Ok | 436.59 | 628 | Ok | 500 | 1005 | Ok |
| | FB2 | 200X500 | 2.775 | 272 | 942 | Ok | 272 | 942 | Ok | 544 | 942 | Ok | 272 | 628 | Ok | 440 | 628 | Ok | 1089 | 1256 | Ok | 1250.35 | 1005 | Not Ok | 1519 | 1005 | Not Ok | 1706.7 | 1005 | Not Ok |
| | FB3 | 200X750 | 10.19 | 461 | 1256 | Ok | 1066 | 1256 | Ok | 456 | 1256 | Ok | 922 | 1256 | Ok | 363 | 628 | Ok | 912 | 1256 | Ok | 785 | 1570 | Ok | 548.83 | 981 | Ok | 782.82 | 1570 | Ok |
| | FB4 | 200X500 | 2.69 | 539 | 942 | Ok | 270 | 942 | Ok | 270 | 942 | Ok | 1079 | 1256 | Ok | 450 | 628 | Ok | 270 | 628 | Ok | 1673.89 | 1005 | Not Ok | 1497.39 | 1005 | Not Ok | 1244.39 | 1005 | Not Ok |
| | FB5 | 200X500 | 3.845 | 231 | 942 | Ok | 231 | 942 | Ok | 231 | 942 | Ok | 231 | 628 | Ok | 231 | 942 | Ok | 309 | 942 | Ok | 507 | 1005 | Ok | 408 | 628 | Ok | 473.5 | 1005 | Ok |
| | FB67 | 200X500 | 1.935 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 628 | Ok | 231 | 628 | Ok | 231 | 628 | Ok | 544.85 | 1005 | Ok | 496.86 | 1005 | Ok | 521 | 1005 | Ok |
| | FB68 | 200X500 | 2.77 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 628 | Ok | 150 | 628 | Ok | 231 | 1608 | Ok | 503.78 | 1005 | Ok | 377.84 | 628 | Ok | 484.13 | 1005 | Ok |
| | FB69 | 200X500 | 10.52 | 537 | 980 | Ok | 924 | 1470 | Ok | 532 | 980 | Ok | 363 | 1608 | Ok | 363 | 628 | Ok | 363 | 1608 | Ok | 536.43 | 1570 | Ok | 262.8 | 981 | Ok | 534.86 | 1570 | Ok |
| | FB70 | 200X575 | 2.77 | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 1608 | Ok | 175 | 628 | Ok | 271 | 628 | Ok | 521 | 1005 | Ok | 456 | 628 | Ok | 538 | 1005 | Ok |
| | FB71 | 200X575 | 1.935 | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 628 | Ok | 271 | 628 | Ok | 271 | 628 | Ok | 572 | 1005 | Ok | 556 | 1005 | Ok | 600 | 1005 | Ok |
| | FB76 | 200X500 | 5.03 | 231 | 603 | Ok | 242 | 603 | Ok | 231 | 603 | Ok | 353 | 804 | Ok | 231 | 402 | Ok | 398 | 1030 | Ok | 422.39 | 1005 | Ok | 389 | 628 | Ok | 565 | 1005 | Ok |
| | FB77 | 200X500 | 3.276 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 261 | 603 | Ok | 231 | 603 | Ok | 231 | 804 | Ok | 483.24 | 1005 | Ok | 291 | 628 | Ok | 307.93 | 1005 | Ok |
| | FB78 | 200X500 | 4.3 | 231 | 603 | Ok | 260 | 603 | Ok | 375 | 603 | Ok | 231 | 603 | Ok | 489 | 402 | Not Ok | 749 | 603 | Not Ok | 470 | 1005 | Ok | 450 | 628 | Ok | 1085 | 1005 | Not Ok |
| | FB79 | 200X500 | 3.51 | 231 | 603 | Ok | 260 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 402 | Ok | 231 | 603 | Ok | 446.26 | 1005 | Ok | 370.47 | 628 | Ok | 475.9 | 1005 | Ok |
| | FB80 | 200X575 | 3.276 | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 942 | Ok | 271 | 1256 | Ok | 271 | 1256 | Ok | 344 | 1256 | Ok | 426.87 | 1005 | Ok | 400 | 628 | Ok | 587 | 1005 | Ok |
| | FB81 | 200X575 | 5.03 | 271 | 942 | Ok | 399 | 942 | Ok | 337 | 942 | Ok | 545 | 1256 | Ok | 271 | 1256 | Ok | 294 | 1256 | Ok | 726.6 | 1005 | Ok | 495 | 628 | Ok | 501 | 1005 | Ok |
| | FB82 | 200X500 | 3.465 | 150 | 603 | Ok | 178 | 603 | Ok | 150 | 603 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 1005 | Ok |
| | FB83 | 150X300 | 0.78 | 86 | 226 | Ok | 61 | 226 | Ok | 61 | 226 | Ok | 61 | 226 | Ok | 61 | 226 | Ok | 109 | 226 | Ok | 166.27 | 502 | Ok | 166.27 | 502 | Ok | 166.27 | 502 | Ok |
| | FB86 | 200X500 | 1.93 | 150 | 603 | Ok | 150 | 603 | Ok | 150 | 603 | Ok | 150 | 603 | Ok | 150 | 603 | Ok | 150 | 603 | Ok | 221.67 | 1005 | Ok | 221.69 | 1005 | Ok | 221.69 | 1005 | Ok |
| | FB87 | 150X300 | 0.78 | 61 | 226 | Ok | 61 | 226 | Ok | 94 | 226 | Ok | 114 | 226 | Ok | 61 | 226 | Ok | 61 | 226 | Ok | 166.27 | 502 | Ok | 166.27 | 502 | Ok | 166.27 | 502 | Ok |
| | FB89 | 150X500 | 1.6 | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 166.27 | 670 | Ok | 166.27 | 670 | Ok | 166.27 | 670 | Ok |
| | FB90 | 200X500 | 3.23 | 231 | 603 | Ok | 308 | 603 | Ok | 339 | 603 | Ok | 363 | 1030 | Ok | 231 | 1030 | Ok | 231 | 1030 | Ok | 517.19 | 1005 | Ok | 447.44 | 1005 | Ok | 249.26 | 1005 | Ok |
| | FB91 | 200X500 | 4.776 | 309 | 603 | Ok | 243 | 804 | Ok | 231 | 603 | Ok | 231 | 1030 | Ok | 231 | 402 | Ok | 231 | 603 | Ok | 221.69 | 1005 | Ok | 282.39 | 628 | Ok | 326.48 | 1005 | Ok |
| | FB92 | 200X500 | 1.5 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 566 | 1005 | Ok | 600 | 1005 | Ok | 607.34 | 1005 | Ok |
| | FB93 | 200X500 | 1.93 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 466.47 | 1005 | Ok | 462 | 1005 | Ok | 471 | 1005 | Ok |
| | FB94 | 200X500 | 1.5 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 590 | 1005 | Ok | 583 | 1005 | Ok | 570 | 1005 | Ok |
| | FB95 | 200X500 | 4.775 | 231 | 603 | Ok | 309 | 804 | Ok | 231 | 603 | Ok | 231 | 804 | Ok | 231 | 402 | Ok | 266 | 1030 | Ok | 435.47 | 1005 | Ok | 270 | 628 | Ok | 489.35 | 1005 | Ok |
| | FB96 | 200X500 | 3.23 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 356 | 1030 | Ok | 231 | 1030 | Ok | 231 | 1030 | Ok | 546.26 | 1005 | Ok | 479.96 | 1005 | Ok | 398.49 | 1005 | Ok |
| | FB98 | 200X500 | 5.03 | 150 | 716 | Ok | 165 | 716 | Ok | 150 | 716 | Ok | 150 | 1344 | Ok | 150 | 402 | Ok | 332 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 628 | Ok |
| | FB99 | 200X500 | 1.865 | 286 | 1470 | Ok | 257 | 147 | Not Ok | 300 | 1470 | Ok | 353 | 1470 | Ok | 300 | 1470 | Ok | 262 | 1470 | Ok | 623.05 | 1005 | Ok | 632.62 | 1005 | Ok | 618.77 | 1005 | Ok |
| | FB100 | 200X500 | 5.03 | 150 | 716 | Ok | 165 | 716 | Ok | 150 | 716 | Ok | 385 | 1344 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 628 | Ok |
| | FB101 | 200X500 | 5.03 | 150 | 716 | Ok | 168 | 716 | Ok | 150 | 716 | Ok | 150 | 1344 | Ok | 150 | 402 | Ok | 314 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 628 | Ok |
| | FB103 | 200X500 | 1.865 | 296 | 1470 | Ok | 250 | 147 | Not Ok | 311 | 1470 | Ok | 357 | 1470 | Ok | 287 | 1470 | Ok | 285 | 1470 | Ok | 637.98 | 1005 | Ok | 634.37 | 1005 | Ok | 627.76 | 1005 | Ok |
| | FB104 | 200X500 | 5.03 | 150 | 716 | Ok | 165 | 716 | Ok | 150 | 716 | Ok | 385 | 1344 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 628 | Ok |
| | FB106 | 200X500 | 3.23 | 231 | 603 | Ok | 302 | 603 | Ok | 345 | 603 | Ok | 405 | 1030 | Ok | 231 | 1030 | Ok | 231 | 1030 | Ok | 552.2 | 1005 | Ok | 482.45 | 1005 | Ok | 244.94 | 1005 | Ok |
| | FB107 | 200X500 | 4.775 | 359 | 603 | Ok | 372 | 804 | Ok | 231 | 603 | Ok | 231 | 1030 | Ok | 231 | 402 | Ok | 342 | 603 | Ok | 236.24 | 1005 | Ok | 359.95 | 628 | Ok | 476.73 | 1005 | Ok |
| | FB108 | 200X500 | 1.485 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 577.5 | 1005 | Ok | 591 | 1005 | Ok | 600 | 1005 | Ok |
| | FB109 | 200X500 | 1.93 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 475.84 | 1005 | Ok | 466.73 | 1005 | Ok | 468.8 | 1005 | Ok |
| | FB110 | 200X500 | 1.5 | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 231 | 1470 | Ok | 1061 | 1005 | Not Ok | 1095 | 1005 | Not Ok | 1100 | 1005 | Not Ok |
| | FB111 | 200X500 | 4.775 | 231 | 603 | Ok | 320 | 804 | Ok | 231 | 603 | Ok | 231 | 804 | Ok | 231 | 402 | Ok | 265 | 1030 | Ok | 412.39 | 1005 | Ok | 270 | 628 | Ok | 493.38 | 1005 | Ok |
| | FB112 | 200X500 | 3.23 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 362 | 1030 | Ok | 231 | 1030 | Ok | 231 | 1030 | Ok | 536.63 | 1005 | Ok | 480.84 | 1005 | Ok | 386 | 1005 | Ok |
| | FB118 | 200X500 | 5.03 | 160 | 603 | Ok | 150 | 603 | Ok | 150 | 603 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 221.69 | 1005 | Ok |
| | FB117 | 150X500 | 1.625 | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 112 | 226 | Ok | 166.27 | 670 | Ok | 166.27 | 670 | Ok | 166.27 | 670 | Ok |
| | FB119 | 200X500 | 5.03 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 349 | 804 | Ok | 231 | 402 | Ok | 437 | 1030 | Ok | 401 | 1005 | Ok | 565 | 628 | Ok | 601.7 | 1005 | Ok |
| | FB120 | 200X500 | 3.274 | 231 | 603 | Ok | 233 | 603 | Ok | 231 | 603 | Ok | 287 | 603 | Ok | 231 | 603 | Ok | 231 | 804 | Ok | 620.25 | 1005 | Ok | 333.57 | 628 | Ok | 436.14 | 1005 | Ok |
| | FB121 | 200X500 | 4.295 | 231 | 603 | Ok | 256 | 603 | Ok | 362 | 603 | Ok | 231 | 603 | Ok | 231 | 402 | Ok | 665 | 603 | Not Ok | 620 | 1005 | Ok | 543 | 628 | Ok | 820 | 1005 | Ok |
| | FB122 | 200X500 | 1.93 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 304 | 603 | Ok | 231 | 603 | Ok | 313 | 603 | Ok | 500 | 1005 | Ok | 500 | 1005 | Ok | 510.58 | 1005 | Ok |
| | FB123 | 200X500 | 4.295 | 365 | 603 | Ok | 307 | 603 | Ok | 256 | 603 | Ok | 733 | 603 | Not Ok | 256 | 402 | Ok | 256 | 603 | Ok | 915 | 1005 | Ok | 610 | 628 | Ok | 694 | 1005 | Ok |
| | FB124 | 200X500 | 3.276 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 804 | Ok | 388 | 1005 | Ok | 255.48 | 628 | Ok | 454.43 | 1005 | Ok |
| | FB125 | 200X500 | 5.03 | 231 | 603 | Ok | 326 | 603 | Ok | 231 | 603 | Ok | 349 | 804 | Ok | 231 | 402 | Ok | 365 | 1030 | Ok | 651.5 | 1005 | Ok | 385 | 628 | Ok | 518.3 | 1005 | Ok |
| | FB126 | 200X500 | 5.03 | 150 | 603 | Ok | 255 | 603 | Ok | 150 | 603 | Ok | 150 | 402 | Ok | 150 | 402 | Ok | 321 | 402 | Ok | 221.69 | 1005 | Ok | 221.69 | 628 | Ok | 247.16 | 1005 | Ok |
| | FB131 | 200X500 | 1.935 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 628 | Ok | 231 | 628 | Ok | 231 | 628 | Ok | 536.79 | 1005 | Ok | 490 | 1005 | Ok | 511.28 | 1005 | Ok |
| | FB132 | 200X500 | 2.769 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 628 | Ok | 150 | 628 | Ok | 231 | 1608 | Ok | 488.14 | 1005 | Ok | 373.95 | 628 | Ok | 467.47 | 1005 | Ok |
| | FB133 | 200X750 | 10.52 | 534 | 980 | Ok | 918 | 1470 | Ok | 536 | 980 | Ok | 363 | 1608 | Ok | 363 | 628 | Ok | 363 | 1608 | Ok | 534.77 | 1005 | Ok | 262.77 | 628 | Ok | 529.98 | 1005 | Ok |
| | FB134 | 200X500 | 2.77 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 1608 | Ok | 150 | 628 | Ok | 231 | 628 | Ok | 470.5 | 1005 | Ok | 375.26 | 628 | Ok | 486.16 | 1005 | Ok |
| | FB135 | 200X500 | 1.935 | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 603 | Ok | 231 | 628 | Ok | 231 | 628 | Ok | 231 | 628 | Ok | 507 | 1005 | Ok | 488 | 1005 | Ok | 532 | 1005 | Ok |
| | FB6 | 200X500 | 3.53 | 231 | 804 | Ok | 231 | 804 | Ok | 231 | 804 | Ok | 231 | 402 | Ok | 231 | 402 | Ok | 425 | 402 | Not Ok | 1025 | 503 | Not Ok | 968 | 503 | Not Ok | 600 | 838 | Ok |
| | FB7 | 200X500 | 3.53 | 231 | 804 | Ok | 231 | 804 | Ok | 231 | 804 | Ok | 405 | 402 | Not Ok | 231 | 402 | Ok | 231 | 402 | Ok | 472 | 503 | Ok | 441 | 503 | Ok | 436 | 838 | Ok |
| | FB60 | 200X500 | 0.865 | 150 | 226 | Ok | 150 | 226 | Ok | 150 | 226 | Ok | 150 | 226 | Ok | 150 | 226 | Ok | 150 | 226 | Ok | 221.69 | 670 | Ok | 221.69 | 670 | Ok | 221.69 | 670 | Ok |
| | FB61 | 200x300 | 0.78 | 82 | 226 | Ok | 82 | 226 | Ok | 82 | 226 | Ok | 82 | 226 | Ok | 82 | 226 | Ok | 82 | 226 | Ok | 221.69 | 502 | Ok | 221.69 | 502 | Ok | 221.69 | 502 | Ok |

| Tower C- Beam reinforcement details without distress-1F | | | | | | | | | | | | | | | | | | | | | Sheet no: ST-WD-REB.117C-020 | | | | | | | | Annexure 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Floor | Beam Details | | | Bottom reinforcement | | | | | | | | | Top reinforcement | | | | | | | | | Shear reinforcement | | | | | | | | |
| | | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | |
| | Beam no. | size in mm | length (m) | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status |
| 1F | FB1/FB73 | 200X450 | 3.845 | 527 | 829 | ok | 413 | 829 | ok | 333 | 829 | ok | 776 | 1256 | ok | 315 | 628 | ok | 205 | 1256 | ok | 784.69 | 1005 | ok | 689 | 1005 | ok | 825.5 | 1005 | ok |
| | FB2/FB74 | 200X450 | 2.93 | 473 | 829 | ok | 317 | 829 | ok | 635 | 829 | ok | 358 | 1256 | ok | 490 | 829 | ok | 1269 | 829 | Not ok | 1024 | 1005 | Not ok | 1279 | 1005 | Not ok | 1466 | 1005 | Not ok |
| | FB3/FB75 | 200X750 | 10.19 | 503 | 942 | ok | 1072 | 1256 | ok | 498 | 1256 | ok | 1007 | 1922 | ok | 363 | 628 | ok | 995 | 1922 | ok | 785.82 | 1005 | ok | 564.56 | 628 | ok | 786 | 1005 | ok |
| | FB4/FB76 | 200X450 | 2.93 | 639 | 829 | ok | 319 | 829 | ok | 403 | 829 | ok | 1278 | 829 | Not ok | 502 | 829 | ok | 319 | 1256 | ok | 1480 | 1005 | Not ok | 1294 | 1005 | Not ok | 1040 | 1005 | Not ok |
| | FB5/FB77 | 200X450 | 3.845 | 465 | 829 | ok | 335 | 829 | ok | 527 | 829 | ok | 609 | 1256 | ok | 205 | 628 | ok | 770 | 1256 | ok | 834 | 1005 | ok | 686.75 | 1005 | ok | 782 | 1005 | ok |
| | FB6/FB71 | 200X500 | 5.045 | 412 | 402 | Not ok | 391 | 716 | ok | 231 | 402 | ok | 823 | 603 | Not ok | 238 | 402 | ok | 231 | 603 | ok | 691.8 | 1005 | ok | 556.6 | 502 | Not ok | 527.3 | 1005 | ok |
| | FB7/FB165 | 200X500 | 3.53 | 231 | 402 | ok | 265 | 603 | ok | 360 | 402 | ok | 231 | 603 | ok | 403 | 402 | Not ok | 720 | 603 | Not ok | 449 | 1005 | ok | 455 | 502 | ok | 499.26 | 1005 | ok |
| | FB8/FB166 | 200X500 | 3.53 | 364 | 402 | ok | 253 | 603 | ok | 231 | 402 | ok | 727 | 603 | Not ok | 412 | 402 | Not ok | 231 | 603 | ok | 503.25 | 1005 | ok | 459.17 | 502 | ok | 447.33 | 1005 | ok |
| | FB9/FB72 | 200X500 | 5.045 | 231 | 402 | ok | 397 | 716 | ok | 407 | 402 | Not ok | 231 | 603 | ok | 231 | 402 | ok | 814 | 603 | Not ok | 525.35 | 1005 | ok | 550.83 | 502 | Not ok | 680.39 | 1005 | ok |
| | FB10/FB65 | 200X500 | 5.045 | 419 | 1608 | ok | 454 | 1608 | ok | 311 | 1608 | ok | 839 | 1608 | ok | 249 | 628 | ok | 414 | 1608 | ok | 595.84 | 1005 | ok | 496.53 | 628 | ok | 842.28 | 1005 | ok |
| | FB11/FB66 | 200X500 | 3.53 | 258 | 1608 | ok | 231 | 1570 | ok | 231 | 1570 | ok | 515 | 1608 | ok | 231 | 1608 | ok | 387 | 1608 | ok | 633.45 | 1005 | ok | 337 | 628 | ok | 909 | 1005 | ok |
| | FB12/FB67 | 200X450 | 3.73 | 205 | 942 | ok | 235 | 942 | ok | 314 | 942 | ok | 205 | 1608 | ok | 217 | 628 | ok | 628 | 1608 | ok | 410.63 | 1005 | ok | 428.88 | 628 | ok | 610.95 | 1005 | ok |
| | FB16 | 200X500 | 2.73 | 546 | 942 | ok | 163 | 942 | ok | 553 | 942 | ok | 517 | 1118 | ok | 201 | 1118 | ok | 510 | 1118 | ok | 294 | 1005 | ok | 252 | 1005 | ok | 294 | 1005 | ok |
| | FB13/FB68 | 200X450 | 3.73 | 324 | 942 | ok | 227 | 942 | ok | 205 | 942 | ok | 648 | 1608 | ok | 229 | 628 | ok | 215 | 1608 | ok | 620 | 1005 | ok | 430 | 628 | ok | 411 | 1005 | ok |
| | FB14/FB69 | 200X500 | 3.53 | 231 | 1608 | ok | 231 | 1570 | ok | 268 | 1570 | ok | 318 | 1608 | ok | 231 | 1608 | ok | 535 | 1608 | ok | 667 | 1005 | ok | 344 | 628 | ok | 898 | 1005 | ok |
| | FB15/FB70 | 200X500 | 5.045 | 306 | 1608 | ok | 461 | 1608 | ok | 407 | 1608 | ok | 426 | 1608 | ok | 233 | 628 | ok | 814 | 1608 | ok | 830 | 1005 | ok | 482 | 628 | ok | 581 | 1005 | ok |
| | FB17/FB62 | 200X500 | 3.73 | 150 | 628 | ok | 323 | 628 | ok | 334 | 829 | ok | 150 | 628 | ok | 449 | 628 | ok | 692 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB18/FB63 | 200X500 | 3.73 | 337 | 628 | ok | 327 | 628 | ok | 150 | 829 | ok | 799 | 628 | Not ok | 464 | 628 | ok | 150 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB21/FB64 | 200X500 | 2.73 | 931 | 942 | ok | 240 | 942 | ok | 930 | 942 | ok | 828 | 1118 | ok | 326 | 1118 | ok | 825 | 1118 | ok | 563 | 1005 | ok | 550 | 1005 | ok | 557.62 | 1005 | ok |
| | FB19/FB60 | 200X500 | 5.045 | 415 | 628 | ok | 479 | 1256 | ok | 438 | 628 | ok | 830 | 603 | Not ok | 231 | 402 | ok | 828 | 603 | Not ok | 804.49 | 1005 | ok | 712.78 | 558 | Not ok | 891.25 | 1005 | ok |
| | FB20/FB61 | 200X500 | 5.045 | 410 | 628 | ok | 458 | 1256 | ok | 359 | 628 | ok | 793 | 603 | Not ok | 183 | 402 | ok | 792 | 603 | Not ok | 812 | 1005 | ok | 633 | 558 | Not ok | 725.75 | 1005 | ok |
| | FB22/FB56 | 200X500 | 5.045 | 417 | 628 | ok | 538 | 1256 | ok | 313 | 628 | ok | 835 | 1256 | ok | 231 | 628 | ok | 626 | 1256 | ok | 935 | 1005 | ok | 686.42 | 628 | Not ok | 868.49 | 1005 | ok |
| | FB57/FB20 | 200X500 | 3.53 | 354 | 628 | ok | 308 | 942 | ok | 469 | 628 | ok | 684 | 1256 | ok | 313 | 628 | ok | 752 | 1256 | ok | 782 | 1005 | ok | 667 | 628 | Not ok | 736.5 | 1005 | ok |
| | FB26/FB53 | 200X500 | 3.73 | 580 | 628 | ok | 354 | 628 | ok | 357 | 628 | ok | 681 | 942 | ok | 299 | 628 | ok | 657 | 1256 | ok | 680 | 1005 | ok | 664 | 628 | Not ok | 733 | 1005 | ok |
| | FB27/FB54 | 200X500 | 2.73 | 285 | 628 | ok | 231 | 628 | ok | 268 | 628 | ok | 570 | 1256 | ok | 231 | 1256 | ok | 536 | 1256 | ok | 781.77 | 1005 | ok | 602.38 | 1005 | ok | 798.91 | 1005 | ok |
| | FB28/FB55 | 200X500 | 3.73 | 363 | 628 | ok | 288 | 628 | ok | 566 | 628 | ok | 661 | 1256 | ok | 244 | 628 | ok | 657 | 942 | ok | 783 | 1005 | ok | 679 | 628 | Not ok | 672 | 1005 | ok |
| | FB24/FB58 | 200X500 | 3.53 | 449 | 628 | ok | 296 | 942 | ok | 367 | 628 | ok | 762 | 1256 | ok | 322 | 628 | ok | 647 | 1256 | ok | 730 | 1005 | ok | 660 | 628 | Not ok | 755.8 | 1005 | ok |
| | FB25/FB59 | 200X500 | 5.045 | 325 | 628 | ok | 533 | 1256 | ok | 400 | 628 | ok | 650 | 1256 | ok | 231 | 628 | ok | 799 | 1256 | ok | 881.4 | 1005 | ok | 695.12 | 628 | Not ok | 931.67 | 1005 | ok |
| | FB34/FB44 | 200X500 | 3.53 | 270 | 1030 | ok | 330 | 1030 | ok | 150 | 1030 | ok | 150 | 628 | ok | 150 | 628 | ok | 161 | 628 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB35/FB50 | 200X500 | 3.53 | 150 | 1030 | ok | 323 | 1030 | ok | 279 | 1030 | ok | 150 | 628 | ok | 150 | 628 | ok | 150 | 628 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB31 | 200X500 | 1.945 | 294 | 980 | ok | 693 | 1470 | ok | 1011 | 1470 | ok | 150 | 1470 | ok | 818 | 2450 | ok | 1234 | 2450 | ok | 1156 | 1005 | Not ok | 1230 | 1005 | Not ok | 1240 | 1005 | Not ok |
| | FB45 | 200X500 | 1.945 | 294 | 2940 | ok | 693 | 2940 | ok | 1011 | 2940 | ok | 150 | 2940 | ok | 818 | 2940 | ok | 1234 | 2940 | ok | 1156 | 1570 | ok | 1230 | 1570 | ok | 1240 | 1570 | ok |
| | FB33 | 200X500 | 1.945 | 982 | 1470 | ok | 682 | 1470 | ok | 298 | 980 | ok | 1210 | 2450 | ok | 824 | 2450 | ok | 298 | 1470 | ok | 1245 | 1005 | Not ok | 1235 | 1005 | Not ok | 1148 | 1005 | Not ok |
| | FB49 | 200X500 | 1.945 | 982 | 2940 | ok | 682 | 2940 | ok | 298 | 2940 | ok | 1210 | 2940 | ok | 824 | 2940 | ok | 298 | 2940 | ok | 1245 | 1570 | ok | 1235 | 1570 | ok | 1148 | 1570 | ok |
| | FB46/FB48 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 618 | 1570 | ok | 608 | 1570 | ok | 609.7 | 1570 | ok |
| | FB32 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 620 | 1005 | ok | 598 | 1005 | ok | 622.35 | 1005 | ok |
| | FB47 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 620 | 1570 | ok | 598 | 1570 | ok | 622.35 | 1570 | ok |
| | FB51/FB52 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB37/FB41 | 200X500 | 3.135 | 540 | 942 | ok | 423 | 942 | ok | 231 | 942 | ok | 520 | 1118 | ok | 231 | 1118 | ok | 231 | 1118 | ok | 560 | 1005 | ok | 530 | 628 | ok | 598 | 1005 | ok |
| | FB38/FB42 | 200X500 | 3.135 | 231 | 942 | ok | 447 | 942 | ok | 542 | 942 | ok | 231 | 1118 | ok | 231 | 1118 | ok | 500 | 1118 | ok | 628.8 | 1005 | ok | 576.73 | 628 | ok | 580.85 | 1005 | ok |
| | FB36/FB40 | 200X500 | 3.44 | 150 | 628 | ok | 150 | 628 | ok | 150 | 628 | ok | 150 | 628 | ok | 510 | 628 | ok | 796 | 628 | Not ok | 221.69 | 628 | ok | 221.69 | 628 | ok | 221.69 | 628 | ok |
| | FB39/FB43 | 200X500 | 3.44 | 150 | 628 | ok | 150 | 628 | ok | 150 | 628 | ok | 906 | 628 | Not ok | 490 | 628 | ok | 150 | 628 | ok | 221.69 | 628 | ok | 221.69 | 628 | ok | 221.69 | 628 | ok |
| | FB29/FB30 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB78/FB148 | 200X500 | 1.935 | 256 | 603 | ok | 231 | 603 | ok | 264 | 603 | ok | 296 | 942 | ok | 231 | 942 | ok | 256 | 942 | ok | 616.44 | 1005 | ok | 560.55 | 1005 | ok | 577.77 | 1005 | ok |
| | FB79/FB149 | 200X500 | 2.77 | 231 | 603 | ok | 231 | 603 | ok | 233 | 603 | ok | 304 | 628 | ok | 231 | 628 | ok | 231 | 1608 | ok | 534.1 | 1005 | ok | 417 | 628 | ok | 492.53 | 1005 | ok |
| | FB80/FB150 | 200X750 | 10.51 | 563 | 942 | ok | 1049 | 1256 | ok | 532 | 942 | ok | 416 | 1922 | ok | 363 | 628 | ok | 411 | 1922 | ok | 572 | 1005 | ok | 320 | 628 | ok | 560 | 1005 | ok |
| | FB81/FB151 | 200X500 | 2.77 | 231 | 942 | ok | 231 | 942 | ok | 231 | 942 | ok | 231 | 1608 | ok | 231 | 628 | ok | 277 | 628 | ok | 477 | 1005 | ok | 398 | 628 | ok | 507 | 1005 | ok |
| | FB82/FB152 | 200X500 | 1.935 | 237 | 942 | ok | 231 | 942 | ok | 266 | 942 | ok | 250 | 942 | ok | 231 | 942 | ok | 272 | 942 | ok | 545 | 1005 | ok | 526 | 1005 | ok | 577 | 1005 | ok |
| | FB87/FB142 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB98/FB131/FB99/FB132 | 150x450 | 1.6 | 99 | 226 | ok | 112 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB83/FB146/FB84/FB147 | 150X500 | 1.5 | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB85/FB144/FB86/FB145 | 200X500 | 1.5 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB88/FB143 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB91/FB133 | 200X500 | 5.03 | 335 | 942 | ok | 482 | 942 | ok | 231 | 942 | ok | 670 | 1608 | ok | 231 | 628 | ok | 387 | 1256 | ok | 1706 | 1005 | Not ok | 656 | 628 | Not ok | 929 | 1005 | ok |
| | FB92/FB134 | 200X500 | 3.376 | 150 | 1256 | ok | 231 | 1256 | ok | 182 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB89/FB140 | 200X450 | 4.39 | 248 | 402 | ok | 356 | 716 | ok | 155 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 927 | 716 | Not ok | 221.69 | 502 | ok | 306 | 502 | ok | 556 | 1005 | ok |
| | FB90/FB141 | 200X450 | 4.39 | 144 | 402 | ok | 298 | 716 | ok | 213 | 402 | ok | 805 | 402 | Not ok | 133 | 402 | ok | 133 | 716 | ok | 510 | 502 | Not ok | 224.68 | 502 | ok | 221.69 | 1005 | ok |
| | FB96/FB138 | 200X500 | 3.376 | 181 | 1256 | ok | 229 | 1256 | ok | 150 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB97/FB139 | 200X575 | 5.03 | 231 | 942 | ok | 481 | 942 | ok | 346 | 942 | ok | 317 | 1608 | ok | 231 | 628 | ok | 691 | 1256 | ok | 710 | 1005 | ok | 728 | 628 | Not ok | 875 | 1005 | ok |
| | FB104/FB120 | 200X500 | 3.23 | 231 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 270 | 1256 | ok | 231 | 1256 | ok | 398 | 1256 | ok | 350 | 1005 | ok | 442 | 1005 | ok | 486 | 1005 | ok |
| | FB105/FB121 | 200X500 | 4.776 | 231 | 628 | ok | 384 | 942 | ok | 231 | 628 | ok | 293 | 1256 | ok | 231 | 628 | ok | 301 | 1256 | ok | 620 | 1005 | ok | 367 | 628 | ok | 490 | 1005 | ok |
| | FB106/FB122 | 200X500 | 1.514 | 402 | 628 | ok | 313 | 628 | ok | 231 | 628 | ok | 318 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 785 | 1005 | ok | 793 | 1005 | ok | 851 | 1005 | ok |
| | FB107/FB123 | 200X500 | 1.93 | 231 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 528 | 1005 | ok | 476 | 1005 | ok | 531 | 1005 | ok |
| | FB108/FB124 | 200X500 | 1.51 | 231 | 628 | ok | 242 | 628 | ok | 296 | 628 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 234 | 1256 | ok | 708 | 1005 | ok | 662 | 1005 | ok | 656 | 1005 | ok |
| | FB109/FB125 | 200X500 | 4.876 | 231 | 628 | ok | 360 | 942 | ok | 231 | 628 | ok | 316 | 1256 | ok | 231 | 628 | ok | 336 | 942 | ok | 502 | 1005 | ok | 395 | 628 | ok | 609 | 1005 | ok |
| | FB110/FB126 | 200X500 | 3.23 | 231 | 628 | ok | 231 | 628 | ok | 236 | 628 | ok | 440 | 1256 | ok | 231 | 1256 | ok | 290 | 1256 | ok | 548.27 | 1005 | ok | 497.97 | 105 | Not ok | 413.42 | 1005 | ok |
| | FB112/FB116 | 200X500 | 5.03 | 150 | 603 | ok | 191 | 603 | ok | 150 | 603 | ok | 150 | 628 | ok | 150 | 628 | ok | 370 | 1608 | ok | 221.69 | 608 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB114/FB118 | 200X500 | 5.03 | 150 | 603 | ok | 197 | 603 | ok | 150 | 603 | ok | 452 | 628 | ok | 150 | 628 | ok | 150 | 1608 | ok | 221.69 | 608 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB111/FB119 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 610 | 1005 | ok | 602 | 1005 | ok | 618 | 1005 | ok |
| | FB115 | 150x500 | 1.385 | 112 | 402 | ok | 121 | 402 | ok | 169 | 402 | ok | 112 | 226 | ok | 112 | 226 | ok | 166 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok |
| | FB113/FB117 | 200X500 | 1.865 | 573 | 1470 | ok | 531 | 1470 | ok | 543 | 1470 | ok | 645 | 1470 | ok | 570 | 1470 | ok | 467 | 1470 | ok | 1053 | 1005 | Not ok | 1068 | 1005 | Not ok | 1007 | 1005 | Not ok |
| | FB93/FB135 | 250X450 | 4.29 | 271 | 1256 | ok | 294 | 1256 | ok | 472 | 1256 | ok | 256 | 1960 | ok | 256 | 980 | ok | 944 | 1960 | ok | 663.2 | 837 | ok | 667.31 | 628 | Not ok | 978 | 837 | Not ok |
| | FB95/FB137 | 250X450 | 4.29 | 453 | 1256 | ok | 263 | 1256 | ok | 268 | 1256 | ok | 920 | 1960 | ok | 256 | 980 | ok | 256 | 1960 | ok | 972 | 837 | Not ok | 660 | 628 | Not ok | 664 | 837 | ok |
| | FB94/FB136 | 250X450 | 1.93 | 418 | 628 | ok | 256 | 628 | ok | 430 | 628 | ok | 639 | 628 | Not ok | 364 | 628 | ok | 631 | 628 | Not ok | 922 | 1005 | ok | 898 | 1005 | ok | 931 | 1005 | ok |
| | FB100/FB101/FB129/FB130 | 150x300 | 0.78 | 92 | 226 | ok | 61 | 226 | ok | 61 | 226 | ok | 76 | 226 | ok | 61 | 226 | ok | 123 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok |
| | FB102/FB103/FB127/FB128 | 200x300 | 82 | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |

| Tower C- Beam reinforcement details- 2F &3F | | | | | | | | | | | | | | | | | | | | | Sheet no: ST-WD-REB.117C-022 | | | | | | | | | Annexure 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Floor | Beam Details | | | Bottom reinforcement | | | | | | | | | Top reinforcement | | | | | | | | Shear reinforcement | | | | | | | | | |
| | | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | |
| | Beam no. | size in mm | length (m) | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status | Required | provided | status |
| 2F & 3F | FB1/FB68 | 200X450 | 3.845 | 669 | 829 | ok | 332 | 829 | ok | 557 | 829 | ok | 879 | 1256 | ok | 220 | 628 | ok | 666 | 1256 | ok | 741.29 | 1005 | ok | 683 | 1005 | ok | 825.5 | 1005 | ok |
| | FB2/FB69 | 200X450 | 2.93 | 542 | 829 | ok | 428 | 829 | ok | 727 | 829 | ok | 339 | 1256 | ok | 369 | 829 | ok | 834 | 829 | Not ok | 948 | 1005 | ok | 802 | 1005 | ok | 800 | 1005 | ok |
| | FB3/FB70 | 200X450 | 2.93 | 717 | 829 | ok | 423 | 829 | ok | 538 | 829 | ok | 834 | 1256 | ok | 368 | 829 | ok | 534 | 829 | ok | 837.9 | 1005 | ok | 804 | 1005 | ok | 941 | 1005 | ok |
| | FB4/FB71 | 200X450 | 3.845 | 557 | 829 | ok | 331 | 829 | ok | 668 | 829 | ok | 682 | 1256 | ok | 217 | 628 | ok | 868 | 1256 | ok | 830.59 | 1005 | ok | 680.15 | 1005 | ok | 735.13 | 1005 | ok |
| | FB5/FB64 | 200X500 | 5.045 | 466 | 402 | Not ok | 421 | 716 | ok | 233 | 402 | ok | 931 | 603 | Not ok | 299 | 402 | ok | 233 | 603 | ok | 716.35 | 1005 | ok | 581.83 | 502 | Not ok | 504 | 1005 | ok |
| | FB6/FB65 | 200X500 | 3.53 | 231 | 402 | ok | 427 | 603 | ok | 473 | 402 | Not ok | 231 | 603 | ok | 484 | 402 | Not ok | 877 | 603 | Not ok | 519.23 | 1005 | ok | 530 | 502 | Not ok | 593 | 1005 | ok |
| | FB7/FB66 | 200X500 | 3.53 | 466 | 402 | Not ok | 421 | 603 | ok | 231 | 402 | ok | 231 | 603 | ok | 424 | 402 | Not ok | 460 | 603 | ok | 595 | 1005 | ok | 535 | 502 | Not ok | 518 | 1005 | ok |
| | FB8/FB67 | 200X500 | 5.045 | 231 | 402 | ok | 424 | 716 | ok | 460 | 402 | Not ok | 231 | 603 | ok | 292 | 402 | ok | 920 | 603 | Not ok | 498 | 1005 | ok | 575 | 502 | Not ok | 703.8 | 1005 | ok |
| | FB9/FB58 | 200X500 | 5.045 | 470 | 1608 | ok | 483 | 1608 | ok | 322 | 1608 | ok | 939 | 1608 | ok | 296 | 628 | ok | 403 | 1608 | ok | 624 | 1005 | ok | 525 | 628 | ok | 889 | 1005 | ok |
| | FB10/FB59 | 200X500 | 3.53 | 231 | 1608 | ok | 231 | 1608 | ok | 231 | 1922 | ok | 445 | 1608 | ok | 231 | 1608 | ok | 353 | 1608 | ok | 486 | 1005 | ok | 365 | 628 | ok | 972 | 1005 | ok |
| | FB11/FB60 | 200X450 | 3.73 | 213 | 1922 | ok | 414 | 942 | ok | 514 | 942 | ok | 222 | 1608 | ok | 395 | 628 | ok | 720 | 1608 | ok | 289.6 | 1005 | ok | 305 | 628 | ok | 346 | 1005 | ok |
| | FB19 | 200X500 | 2.73 | 709 | 942 | ok | 285 | 942 | ok | 732 | 942 | ok | 880 | 1118 | ok | 252 | 1118 | ok | 856 | 1118 | ok | 1060 | 1005 | Not ok | 956 | 1005 | ok | 1057 | 1005 | Not ok |
| | FB12/FB61 | 200X450 | 3.73 | 536 | 1922 | ok | 420 | 942 | ok | 225 | 942 | ok | 762 | 1608 | ok | 422 | 628 | ok | 217 | 1608 | ok | 352.4 | 1005 | ok | 314 | 628 | ok | 284.36 | 1005 | ok |
| | FB13/FB62 | 200X500 | 3.53 | 267 | 1608 | ok | 231 | 1608 | ok | 239 | 1922 | ok | 389 | 1608 | ok | 231 | 1608 | ok | 477 | 1608 | ok | 1142 | 1005 | Not ok | 368 | 628 | ok | 817.8 | 1005 | ok |
| | FB14/FB63 | 200X500 | 5.045 | 319 | 1608 | ok | 493 | 1608 | ok | 458 | 1608 | ok | 384 | 1608 | ok | 280 | 628 | ok | 916 | 1608 | ok | 847 | 1005 | ok | 514 | 628 | ok | 613 | 1005 | ok |
| | FB15/FB56 | 200X500 | 3.73 | 150 | 628 | ok | 483 | 628 | ok | 498 | 829 | ok | 150 | 628 | ok | 608 | 628 | ok | 907 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB16/FB57 | 200X500 | 3.73 | 502 | 628 | ok | 492 | 628 | ok | 153 | 829 | ok | 1024 | 628 | Not ok | 619 | 628 | ok | 150 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB17/FB54 | 200X500 | 5.045 | 483 | 628 | ok | 443 | 1256 | ok | 477 | 628 | ok | 966 | 603 | Not ok | 246 | 402 | ok | 909 | 603 | Not ok | 839.62 | 1005 | ok | 723.87 | 558 | Not ok | 874.89 | 1005 | ok |
| | FB18/FB55 | 200X500 | 5.045 | 463 | 628 | ok | 463 | 1256 | ok | 417 | 628 | ok | 919 | 603 | Not ok | 234 | 402 | ok | 952 | 603 | Not ok | 804 | 1005 | ok | 667 | 558 | Not ok | 747 | 1005 | ok |
| | FB20/FB50 | 200X500 | 5.045 | 407 | 628 | ok | 403 | 1256 | ok | 328 | 628 | ok | 814 | 1256 | ok | 244 | 628 | ok | 519 | 1256 | ok | 660 | 1005 | ok | 618 | 628 | ok | 733 | 1005 | ok |
| | FB21/FB51 | 200X500 | 3.53 | 466 | 628 | ok | 353 | 942 | ok | 538 | 628 | ok | 617 | 1256 | ok | 391 | 628 | ok | 939 | 1256 | ok | 877 | 1005 | ok | 860 | 628 | Not ok | 920 | 1005 | ok |
| | FB24/FB47 | 200X500 | 3.73 | 751 | 628 | Not ok | 443 | 628 | ok | 345 | 628 | ok | 796 | 942 | ok | 373 | 628 | ok | 614 | 1256 | ok | 780 | 1005 | ok | 778 | 628 | Not ok | 835 | 1005 | ok |
| | FB25/FB48 | 200X500 | 2.73 | 306 | 628 | ok | 241 | 942 | ok | 284 | 628 | ok | 611 | 1256 | ok | 263 | 1256 | ok | 569 | 1256 | ok | 715 | 1005 | ok | 610 | 1005 | ok | 738 | 1005 | ok |
| | FB26/FB49 | 200X500 | 3.73 | 335 | 628 | ok | 484 | 628 | ok | 745 | 628 | Not ok | 671 | 1265 | ok | 382 | 628 | ok | 831 | 942 | ok | 866 | 105 | Not ok | 771 | 628 | Not ok | 763 | 1005 | ok |
| | FB22/FB52 | 200X500 | 3.53 | 560 | 628 | ok | 364 | 942 | ok | 472 | 628 | ok | 963 | 1256 | ok | 410 | 628 | ok | 609 | 1256 | ok | 925 | 1005 | ok | 871 | 628 | Not ok | 879 | 1005 | ok |
| | FB23/FB53 | 200X500 | 5.045 | 305 | 628 | ok | 389 | 1256 | ok | 394 | 628 | ok | 538 | 1256 | ok | 231 | 628 | ok | 788 | 1256 | ok | 731 | 1005 | ok | 612 | 628 | ok | 654 | 1005 | ok |
| | FB32/FB43 | 200X500 | 3.53 | 314 | 1030 | ok | 384 | 1030 | ok | 150 | 1030 | ok | 153 | 628 | ok | 179 | 628 | ok | 199 | 628 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB33/FB44 | 200X500 | 3.53 | 150 | 1030 | ok | 388 | 1030 | ok | 317 | 1030 | ok | 196 | 628 | ok | 171 | 628 | ok | 150 | 628 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB29 | 200X500 | 1.945 | 384 | 980 | ok | 858 | 1470 | ok | 1241 | 1470 | ok | 384 | 1470 | ok | 1033 | 2450 | ok | 1537 | 2450 | ok | 1436 | 1005 | Not ok | 1529 | 1005 | Not ok | 1538 | 1005 | Not ok |
| | FB38 | 200X500 | 1.945 | 384 | 2940 | ok | 858 | 2940 | ok | 1241 | 2940 | ok | 384 | 2940 | ok | 1033 | 2940 | ok | 1537 | 2940 | ok | 1436 | 1570 | ok | 1529 | 1570 | ok | 1538 | 1570 | ok |
| | FB31 | 200X500 | 1.945 | 1241 | 1470 | ok | 853 | 1470 | ok | 388 | 980 | ok | 1552 | 2450 | ok | 1042 | 2450 | ok | 388 | 1470 | ok | 1541 | 1005 | Not ok | 1532 | 1005 | Not ok | 1430 | 1005 | Not ok |
| | FB42 | 200X500 | 1.945 | 1241 | 2940 | ok | 853 | 2940 | ok | 388 | 2940 | ok | 1552 | 2940 | ok | 1042 | 2940 | ok | 388 | 2940 | ok | 1541 | 1005 | Not ok | 1532 | 1005 | Not ok | 1430 | 1005 | Not ok |
| | FB30 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 612 | 1005 | ok | 609 | 1005 | ok | 605 | 1005 | ok |
| | FB39 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 147 | Not ok | 231 | 1470 | ok | 612 | 1570 | ok | 609 | 1570 | ok | 605 | 1570 | ok |
| | FB41 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 147 | Not ok | 231 | 1470 | ok | 612 | 1570 | ok | 609 | 1570 | ok | 605 | 1570 | ok |
| | FB40 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 617 | 1570 | ok | 598 | 1570 | ok | 620 | 1570 | ok |
| | FB45/FB46 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB34/FB36 | 200X500 | 3.135 | 650 | 942 | ok | 483 | 942 | ok | 231 | 942 | ok | 673 | 1118 | ok | 324 | 1118 | ok | 231 | 1118 | ok | 619 | 1005 | ok | 616 | 628 | ok | 660 | 1005 | ok |
| | FB35/FB37 | 200X500 | 3.135 | 231 | 942 | ok | 516 | 942 | ok | 661 | 942 | ok | 231 | 1118 | ok | 318 | 1118 | ok | 647 | 1118 | ok | 600 | 1005 | ok | 591 | 628 | ok | 645 | 1005 | ok |
| | FB27/FB28 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB72/FB137 | 200X500 | 1.935 | 321 | 603 | ok | 231 | 603 | ok | 337 | 603 | ok | 363 | 942 | ok | 231 | 942 | ok | 324 | 942 | ok | 731 | 1005 | ok | 678 | 1005 | ok | 684 | 1005 | ok |
| | FB73/FB138 | 200X500 | 2.77 | 275 | 603 | ok | 231 | 603 | ok | 330 | 603 | ok | 393 | 628 | ok | 231 | 628 | ok | 295 | 1608 | ok | 643 | 1005 | ok | 528 | 628 | ok | 585 | 1005 | ok |
| | FB74/FB139 | 200X500 | 2.77 | 322 | 603 | ok | 231 | 603 | ok | 283 | 603 | ok | 302 | 628 | ok | 231 | 628 | ok | 388 | 1608 | ok | 573 | 1005 | ok | 511 | 628 | ok | 620 | 1005 | ok |
| | FB75/FB140 | 200X500 | 1.935 | 333 | 603 | ok | 231 | 603 | ok | 332 | 603 | ok | 311 | 942 | ok | 231 | 942 | ok | 345 | 942 | ok | 652 | 1005 | ok | 644 | 1005 | ok | 693 | 1005 | ok |
| | FB78/FB133 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB91/FB92/FB120/FB121 | 150x450 | 1.6 | 99 | 226 | ok | 107 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB76/FB135 | 150X500 | 1.5 | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB77/FB136 | 150X500 | 1.5 | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB80/FB131/FB81/FB132 | 200X500 | 1.5 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB79/FB134 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB86/FB122 | 200X500 | 5.03 | 370 | 1118 | ok | 460 | 1118 | ok | 231 | 1118 | ok | 739 | 1608 | ok | 231 | 628 | ok | 266 | 1256 | ok | 1723 | 1005 | Not ok | 1575 | 628 | Not ok | 725 | 1005 | ok |
| | FB84/FB127 | 200X500 | 3.376 | 150 | 1256 | ok | 253 | 1256 | ok | 203 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB82/FB129 | 200X450 | 4.39 | 145 | 402 | ok | 265 | 716 | ok | 182 | 402 | ok | 133 | 402 | ok | 185 | 402 | ok | 759 | 716 | Not ok | 221.69 | 502 | ok | 306 | 502 | ok | 556 | 1005 | ok |
| | FB83/FB130 | 200X450 | 4.39 | 194 | 402 | ok | 269 | 716 | ok | 164 | 402 | ok | 753 | 402 | Not ok | 161 | 402 | ok | 133 | 716 | ok | 242 | 502 | ok | 221.69 | 502 | ok | 221.69 | 1005 | ok |
| | FB85/FB128 | 200X500 | 3.376 | 192 | 1256 | ok | 243 | 1256 | ok | 150 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB90/FB126 | 200X575 | 5.03 | 231 | 1118 | ok | 457 | 1118 | ok | 362 | 1118 | ok | 231 | 1608 | ok | 231 | 628 | ok | 724 | 1256 | ok | 700 | 1005 | ok | 706 | 628 | Not ok | 853 | 1005 | ok |
| | FB97/FB109 | 200X500 | 3.23 | 246 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 301 | 1256 | ok | 231 | 1256 | ok | 347 | 1256 | ok | 259 | 1005 | ok | 368 | 1005 | ok | 429 | 1005 | ok |
| | FB98/FB110 | 200X500 | 4.776 | 273 | 628 | ok | 425 | 942 | ok | 243 | 628 | ok | 308 | 1256 | ok | 231 | 628 | ok | 352 | 1256 | ok | 643 | 1005 | ok | 387 | 628 | ok | 512 | 1005 | ok |
| | FB99/FB111 | 200X500 | 1.514 | 507 | 628 | ok | 391 | 628 | ok | 231 | 628 | ok | 370 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 839 | 1005 | ok | 921 | 1005 | ok | 965 | 1005 | ok |
| | FB100/FB112 | 200X500 | 1.93 | 231 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 528 | 1005 | ok | 474 | 1005 | ok | 528 | 1005 | ok |
| | FB101/FB113 | 200X500 | 1.51 | 231 | 628 | ok | 270 | 628 | ok | 387 | 628 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 277 | 1256 | ok | 805 | 1005 | ok | 760 | 1005 | ok | 717 | 1005 | ok |
| | FB102/FB114 | 200X500 | 4.876 | 231 | 628 | ok | 401 | 942 | ok | 231 | 628 | ok | 350 | 1256 | ok | 231 | 628 | ok | 231 | 1256 | ok | 530 | 1005 | ok | 430 | 628 | ok | 622 | 1005 | ok |
| | FB103/FB115 | 200X500 | 3.23 | 231 | 628 | ok | 231 | 628 | ok | 280 | 628 | ok | 395 | 1256 | ok | 231 | 1256 | ok | 310 | 1256 | ok | 427 | 1005 | ok | 366 | 1005 | ok | 234 | 1005 | ok |
| | FB104/FB108 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 604 | 1005 | ok | 604 | 1005 | ok | 615 | 1005 | ok |
| | FB106 | 150x500 | 1.385 | 112 | 402 | ok | 153 | 402 | ok | 215 | 402 | ok | 112 | 226 | ok | 132 | 226 | ok | 212 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok |
| | FB105/FB107 | 200X500 | 1.865 | 742 | 1470 | ok | 682 | 1470 | ok | 679 | 1470 | ok | 817 | 1470 | ok | 729 | 1470 | ok | 591 | 1470 | ok | 1293 | 1005 | Not ok | 1321 | 1005 | Not ok | 1232 | 1005 | Not ok |
| | FB87/FB123 | 250X450 | 4.29 | 285 | 1256 | ok | 279 | 1256 | ok | 558 | 1256 | ok | 279 | 1960 | ok | 279 | 980 | ok | 1116 | 1960 | ok | 716 | 837 | ok | 779 | 628 | Not ok | 1094 | 837 | Not ok |
| | FB89/FB125 | 250X450 | 4.29 | 571 | 1256 | ok | 287 | 1256 | ok | 304 | 1256 | ok | 1142 | 1960 | ok | 286 | 980 | ok | 286 | 1960 | ok | 1085 | 837 | Not ok | 782 | 628 | Not ok | 737 | 837 | ok |
| | FB88/FB124 | 250X450 | 1.93 | 231 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 231 | 1960 | ok | 231 | 1960 | ok | 231 | 1960 | ok | 1235 | 837 | Not ok | 1221 | 837 | Not ok | 1261 | 837 | Not ok |
| | FB93/FB94/FB118/FB119 | 150x300 | 0.78 | 68 | 226 | ok | 61 | 226 | ok | 81 | 226 | ok | 106 | 226 | ok | 61 | 226 | ok | 117 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok |
| | FB95/FB96/FB116/FB117 | 200x300 | 82 | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |

| Tower C- Beam reinforcement details- 4F till 10F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sheet no: ST-WD-REB.117C-022d | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Annexure 16 |
| Floor | Beam Details | | | Bottom reinforcement | | | | | | | | | Top reinforcement | | | | | | | | | Shear reinforcement | | | | | | | | | |
| | | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | | |
| | Beam no. | size in mm | length (m) | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | |
| 4F till 10F | FB1/FB68 | 200X450 | 3.845 | 669 | 829 | ok | 332 | 829 | ok | 557 | 829 | ok | 879 | 1256 | ok | 220 | 628 | ok | 666 | 1256 | ok | 741.29 | 1005 | ok | 683 | 1005 | ok | 825.5 | 1005 | ok | |
| | FB2/FB69 | 200X450 | 2.93 | 542 | 829 | ok | 428 | 829 | ok | 727 | 829 | ok | 339 | 1256 | ok | 369 | 829 | ok | 834 | 829 | Not ok | 948 | 1005 | ok | 802 | 1005 | ok | 948 | 1005 | ok | |
| | FB3/FB70 | 200X450 | 2.93 | 717 | 829 | ok | 423 | 829 | ok | 538 | 829 | ok | 834 | 1256 | ok | 368 | 829 | ok | 534 | 829 | ok | 837.9 | 1005 | ok | 804 | 1005 | ok | 941 | 1005 | ok | |
| | FB4/FB71 | 200X450 | 3.845 | 557 | 829 | ok | 331 | 829 | ok | 668 | 829 | ok | 682 | 1256 | ok | 217 | 628 | ok | 868 | 1256 | ok | 830.59 | 1005 | ok | 680.15 | 1005 | ok | 735.13 | 1005 | ok | |
| | FB5/FB64 | 200X500 | 5.045 | 466 | 402 | Not ok | 421 | 716 | ok | 233 | 402 | ok | 931 | 603 | Not ok | 299 | 402 | ok | 233 | 603 | ok | 716.35 | 1005 | ok | 581.83 | 502 | Not ok | 504 | 1005 | ok | |
| | FB6/FB65 | 200X500 | 3.53 | 231 | 402 | ok | 427 | 603 | ok | 473 | 402 | Not ok | 231 | 603 | ok | 484 | 402 | Not ok | 877 | 603 | Not ok | 519.23 | 1005 | ok | 530 | 502 | Not ok | 593 | 1005 | ok | |
| | FB7/FB66 | 200X500 | 3.53 | 466 | 402 | Not ok | 421 | 603 | ok | 231 | 402 | ok | 231 | 603 | ok | 424 | 402 | Not ok | 460 | 603 | ok | 595 | 1005 | ok | 535 | 502 | Not ok | 518 | 1005 | ok | |
| | FB8/FB67 | 200X500 | 5.045 | 231 | 402 | ok | 424 | 716 | ok | 460 | 402 | Not ok | 231 | 603 | ok | 292 | 402 | ok | 920 | 603 | Not ok | 498 | 1005 | ok | 575 | 502 | Not ok | 703.8 | 1005 | ok | |
| | FB9/FB58 | 200X500 | 5.045 | 470 | 1608 | ok | 483 | 1608 | ok | 322 | 1608 | ok | 939 | 1608 | ok | 296 | 628 | ok | 403 | 1608 | ok | 624 | 1005 | ok | 525 | 628 | ok | 889 | 1005 | ok | |
| | FB10/FB59 | 200X500 | 3.53 | 231 | 1608 | ok | 231 | 1608 | ok | 231 | 1922 | ok | 445 | 1608 | ok | 231 | 1608 | ok | 353 | 1608 | ok | 486 | 1005 | ok | 365 | 628 | ok | 972 | 1005 | ok | |
| | FB11/FB60 | 200X450 | 3.73 | 213 | 1922 | ok | 414 | 942 | ok | 514 | 942 | ok | 222 | 1608 | ok | 395 | 628 | ok | 720 | 1608 | ok | 289.6 | 1005 | ok | 305 | 628 | ok | 346 | 1005 | ok | |
| | FB19 | 200X500 | 2.73 | 709 | 942 | ok | 285 | 942 | ok | 732 | 942 | ok | 880 | 1118 | ok | 252 | 1118 | ok | 856 | 1118 | ok | 1060 | 1005 | Not ok | 956 | 1005 | ok | 1057 | 1005 | Not ok | |
| | FB12/FB61 | 200X450 | 3.73 | 536 | 1922 | ok | 420 | 942 | ok | 225 | 942 | ok | 762 | 1608 | ok | 422 | 628 | ok | 217 | 1608 | ok | 352.4 | 1005 | ok | 314 | 628 | ok | 284.36 | 1005 | ok | |
| | FB13/FB62 | 200X500 | 3.53 | 267 | 1608 | ok | 231 | 1608 | ok | 239 | 1992 | ok | 389 | 1608 | ok | 231 | 1608 | ok | 477 | 1608 | ok | 1142 | 1005 | Not ok | 368 | 628 | ok | 817.8 | 1005 | ok | |
| | FB14/FB63 | 200X500 | 5.045 | 319 | 1608 | ok | 493 | 1608 | ok | 458 | 1608 | ok | 384 | 1608 | ok | 280 | 628 | ok | 916 | 1608 | ok | 847 | 1005 | ok | 514 | 628 | ok | 613 | 1005 | ok | |
| | FB15/FB56 | 200X500 | 3.73 | 150 | 628 | ok | 483 | 628 | ok | 498 | 829 | ok | 150 | 628 | ok | 608 | 628 | ok | 907 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok | |
| | FB16/FB57 | 200X500 | 3.73 | 502 | 628 | ok | 492 | 628 | ok | 153 | 829 | ok | 1024 | 628 | Not ok | 619 | 628 | ok | 150 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok | |
| | FB17/FB54 | 200X500 | 5.045 | 483 | 628 | ok | 443 | 1256 | ok | 477 | 628 | ok | 966 | 603 | Not ok | 246 | 402 | ok | 909 | 603 | Not ok | 839.62 | 1005 | ok | 723.87 | 558 | Not ok | 874.89 | 1005 | ok | |
| | FB18/FB55 | 200X500 | 5.045 | 463 | 628 | ok | 463 | 1256 | ok | 417 | 628 | ok | 919 | 603 | Not ok | 234 | 402 | ok | 952 | 603 | Not ok | 804 | 1005 | ok | 667 | 558 | Not ok | 747 | 1005 | ok | |
| | FB20/FB50 | 200X500 | 5.045 | 407 | 628 | ok | 403 | 1256 | ok | 328 | 628 | ok | 814 | 1256 | ok | 244 | 628 | ok | 519 | 1256 | ok | 660 | 1005 | ok | 618 | 628 | ok | 733 | 1005 | ok | |
| | FB21/FB51 | 200X500 | 3.53 | 466 | 628 | ok | 353 | 942 | ok | 538 | 628 | ok | 617 | 1256 | ok | 391 | 628 | ok | 939 | 1256 | ok | 877 | 1005 | ok | 860 | 628 | Not ok | 920 | 1005 | ok | |
| | FB24/FB47 | 200X500 | 3.73 | 751 | 628 | Not ok | 443 | 628 | ok | 345 | 628 | ok | 796 | 942 | ok | 373 | 628 | ok | 614 | 1256 | ok | 780 | 1005 | ok | 778 | 628 | Not ok | 835 | 1005 | ok | |
| | FB25/FB48 | 200X500 | 2.73 | 306 | 628 | ok | 241 | 942 | ok | 284 | 628 | ok | 611 | 1256 | ok | 263 | 1256 | ok | 569 | 1256 | ok | 715 | 1005 | ok | 610 | 1005 | ok | 738 | 1005 | ok | |
| | FB26/FB49 | 200X500 | 3.73 | 335 | 628 | ok | 484 | 628 | ok | 745 | 628 | Not ok | 671 | 1256 | ok | 382 | 628 | ok | 831 | 942 | ok | 866 | 1005 | ok | 771 | 628 | Not ok | 763 | 1005 | ok | |
| | FB22/FB52 | 200X500 | 3.53 | 560 | 628 | ok | 364 | 942 | ok | 472 | 628 | ok | 963 | 1256 | ok | 410 | 628 | ok | 609 | 1256 | ok | 925 | 1005 | ok | 871 | 628 | Not ok | 879 | 1005 | ok | |
| | FB23/FB53 | 200X500 | 5.045 | 305 | 628 | ok | 389 | 1256 | ok | 394 | 628 | ok | 538 | 1256 | ok | 231 | 628 | ok | 788 | 1256 | ok | 731 | 1005 | ok | 612 | 628 | ok | 654 | 1005 | ok | |
| | FB32/FB43 | 200X500 | 3.53 | 314 | 1030 | ok | 384 | 1030 | ok | 150 | 1030 | ok | 153 | 628 | ok | 179 | 628 | ok | 199 | 628 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok | |
| | FB33/FB44 | 200X500 | 3.53 | 150 | 1030 | ok | 388 | 1030 | ok | 317 | 1030 | ok | 196 | 628 | ok | 171 | 628 | ok | 150 | 628 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok | |
| | FB29 | 200X500 | 1.945 | 384 | 980 | ok | 858 | 1470 | ok | 1241 | 1470 | ok | 384 | 1470 | ok | 1033 | 2450 | ok | 1537 | 2450 | ok | 1436 | 1005 | Not ok | 1529 | 1005 | Not ok | 1538 | 1005 | Not ok | |
| | FB38 | 200X500 | 1.945 | 384 | 2940 | ok | 858 | 2940 | ok | 1241 | 2940 | ok | 384 | 2940 | ok | 1033 | 2940 | ok | 1537 | 2940 | ok | 1436 | 1570 | ok | 1529 | 1570 | ok | 1538 | 1570 | ok | |
| | FB31 | 200X500 | 1.945 | 1241 | 1470 | ok | 853 | 1470 | ok | 388 | 980 | ok | 1552 | 2450 | ok | 1042 | 2450 | ok | 388 | 1470 | ok | 1541 | 1005 | Not ok | 1532 | 1005 | Not ok | 1430 | 1005 | Not ok | |
| | FB42 | 200X500 | 1.945 | 1241 | 2940 | ok | 853 | 2940 | ok | 388 | 2940 | ok | 1552 | 2940 | ok | 1042 | 2940 | ok | 388 | 2940 | ok | 1541 | 1570 | ok | 1532 | 1570 | ok | 1430 | 1570 | ok | |
| | FB30 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 612 | 1005 | ok | 609 | 1005 | ok | 605 | 1005 | ok | |
| | FB39 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 612 | 1570 | ok | 609 | 1570 | ok | 605 | 1570 | ok | |
| | FB41 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 612 | 1570 | ok | 609 | 1570 | ok | 605 | 1570 | ok | |
| | FB40 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 617 | 1570 | ok | 598 | 1570 | ok | 620 | 1570 | ok | |
| | FB45/FB46 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | |
| | FB34/FB36 | 200X500 | 3.135 | 650 | 942 | ok | 483 | 942 | ok | 231 | 942 | ok | 673 | 1118 | ok | 324 | 1118 | ok | 231 | 1118 | ok | 619 | 1005 | ok | 616 | 628 | ok | 660 | 1005 | ok | |
| | FB35/FB37 | 200X500 | 3.135 | 231 | 942 | ok | 516 | 942 | ok | 661 | 942 | ok | 231 | 1118 | ok | 318 | 1118 | ok | 647 | 1118 | ok | 600 | 1005 | ok | 591 | 628 | ok | 645 | 1005 | ok | |
| | FB27/FB28 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | |
| | FB72/FB137 | 200X500 | 1.935 | 321 | 603 | ok | 231 | 603 | ok | 337 | 603 | ok | 363 | 942 | ok | 231 | 942 | ok | 324 | 942 | ok | 731 | 1005 | ok | 678 | 1005 | ok | 684 | 1005 | ok | |
| | FB73/FB138 | 200X500 | 2.77 | 275 | 603 | ok | 231 | 603 | ok | 330 | 603 | ok | 393 | 628 | ok | 231 | 628 | ok | 295 | 1608 | ok | 643 | 1005 | ok | 528 | 628 | ok | 585 | 1005 | ok | |
| | FB74/FB139 | 200X500 | 2.77 | 322 | 603 | ok | 231 | 603 | ok | 283 | 603 | ok | 302 | 628 | ok | 231 | 628 | ok | 388 | 1608 | ok | 573 | 1005 | ok | 511 | 628 | ok | 620 | 1005 | ok | |
| | FB75/FB140 | 200X500 | 1.935 | 333 | 603 | ok | 231 | 603 | ok | 332 | 603 | ok | 311 | 942 | ok | 231 | 942 | ok | 345 | 942 | ok | 652 | 1005 | ok | 644 | 1005 | ok | 693 | 1005 | ok | |
| | FB78/FB79/FB133/FB134 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | |
| | FB91/FB92/FB120/FB121 | 150x450 | 1.6 | 99 | 226 | ok | 107 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | |
| | FB76/FB135 | 150X500 | 1.5 | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | |
| | FB77/FB136 | 150X500 | 1.5 | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | |
| | FB80/FB131/FB81/FB132 | 200X500 | 1.5 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | |
| | FB79/FB134 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | |
| | FB86/FB122 | 200X500 | 5.03 | 370 | 1118 | ok | 460 | 1118 | ok | 231 | 1118 | ok | 739 | 1608 | ok | 231 | 648 | ok | 266 | 1256 | ok | 1723 | 1005 | Not ok | 1575 | 628 | Not ok | 725 | 1005 | ok | |
| | FB84/FB127 | 200X500 | 3.376 | 150 | 1256 | ok | 253 | 1256 | ok | 203 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok | |
| | FB82/FB129 | 200X450 | 4.39 | 145 | 402 | ok | 265 | 716 | ok | 182 | 402 | ok | 133 | 402 | ok | 185 | 402 | ok | 759 | 716 | Not ok | 221.69 | 502 | ok | 306 | 502 | ok | 556 | 1005 | ok | |
| | FB83/FB130 | 200X450 | 4.39 | 194 | 402 | ok | 269 | 716 | ok | 164 | 402 | ok | 753 | 402 | Not ok | 161 | 402 | ok | 133 | 716 | ok | 242 | 502 | ok | 221.69 | 502 | ok | 221.69 | 1005 | ok | |
| | FB85/FB128 | 200X500 | 3.376 | 192 | 1256 | ok | 243 | 1256 | ok | 150 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok | |
| | FB90/FB126 | 200X575 | 5.03 | 231 | 1118 | ok | 457 | 1118 | ok | 362 | 1118 | ok | 231 | 1608 | ok | 231 | 648 | ok | 724 | 1256 | ok | 700 | 1005 | ok | 706 | 628 | Not ok | 853 | 1005 | ok | |
| | FB97/FB109 | 200X500 | 3.23 | 246 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 301 | 1256 | ok | 231 | 1256 | ok | 347 | 1256 | ok | 259 | 1005 | ok | 368 | 1005 | ok | 429 | 1005 | ok | |
| | FB98/FB110 | 200X500 | 4.776 | 273 | 628 | ok | 425 | 942 | ok | 243 | 628 | ok | 308 | 1256 | ok | 231 | 628 | ok | 352 | 1256 | ok | 643 | 1005 | ok | 387 | 628 | ok | 512 | 1005 | ok | |
| | FB99/FB111 | 200X500 | 1.514 | 507 | 628 | ok | 391 | 628 | ok | 231 | 628 | ok | 370 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 839 | 1005 | ok | 921 | 1005 | ok | 965 | 1005 | ok | |
| | FB100/FB112 | 200X500 | 1.93 | 231 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 528 | 1005 | ok | 474 | 1005 | ok | 528 | 1005 | ok | |
| | FB101/FB113 | 200X500 | 1.51 | 231 | 628 | ok | 270 | 628 | ok | 387 | 628 | ok | 231 | 1256 | ok | 231 | 1256 | ok | 277 | 1256 | ok | 805 | 1005 | ok | 760 | 1005 | ok | 717 | 1005 | ok | |
| | FB102/FB114 | 200X500 | 4.876 | 231 | 628 | ok | 401 | 942 | ok | 231 | 628 | ok | 350 | 1256 | ok | 231 | 628 | ok | 231 | 1256 | ok | 530 | 1005 | ok | 430 | 628 | ok | 622 | 1005 | ok | |
| | FB103/FB115 | 200X500 | 3.23 | 231 | 628 | ok | 231 | 628 | ok | 280 | 628 | ok | 395 | 1256 | ok | 231 | 1256 | ok | 310 | 1256 | ok | 427 | 1005 | ok | 366 | 1005 | ok | 234 | 1005 | ok | |
| | FB104/FB108 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 604 | 1005 | ok | 604 | 1005 | ok | 615 | 1005 | ok | |
| | FB106 | 150x500 | 1.385 | 112 | 402 | ok | 153 | 402 | ok | 215 | 402 | ok | 112 | 226 | ok | 132 | 226 | ok | 212 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | |
| | FB105/FB107 | 200X500 | 1.865 | 742 | 1470 | ok | 682 | 1470 | ok | 679 | 1470 | ok | 817 | 1470 | ok | 729 | 1470 | ok | 591 | 1470 | ok | 1293 | 1005 | Not ok | 1321 | 1005 | Not ok | 1232 | 1005 | Not ok | |
| | FB87/FB123 | 250X450 | 4.29 | 285 | 1256 | ok | 279 | 1256 | ok | 558 | 1256 | ok | 279 | 1960 | ok | 279 | 980 | ok | 1116 | 1960 | ok | 716 | 837 | ok | 779 | 628 | Not ok | 1094 | 837 | Not ok | |
| | FB89/FB125 | 250X450 | 4.29 | 571 | 1256 | ok | 287 | 1256 | ok | 304 | 1256 | ok | 1142 | 1960 | ok | 286 | 980 | ok | 286 | 1960 | ok | 1085 | 837 | Not ok | 782 | 628 | Not ok | 737 | 837 | ok | |
| | FB88/FB124 | 250X450 | 1.93 | 231 | 628 | ok | 231 | 628 | ok | 231 | 628 | ok | 231 | 2588 | ok | 231 | 2588 | ok | 231 | 2588 | ok | 1235 | 1005 | Not ok | 1221 | 1005 | Not ok | 1261 | 1005 | Not ok | |
| | FB93/FB94/FB118/FB119 | 150x300 | 0.78 | 68 | 226 | ok | 61 | 226 | ok | 81 | 226 | ok | 106 | 226 | ok | 61 | 226 | ok | 117 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | |
| | FB95/FB96/FB116/FB117 | 200x300 | 82 | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | |

**Tower C- Beam reinforcement details- 11F till 22F** | **Sheet no: ST-WD-REB.117C-022h** | **Annexure 17**

| Floor | Beam Details | | | Bottom reinforcement | | | | | | | | | Top reinforcement | | | | | | | | | Shear reinforcement | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | | Left | | | Mid | | | Right | | |
| | Beam no. | size in mm | length (m) | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status | Required | Provided | Status |
| 11F till 12F | FB1/FB68 | 200X450 | 4.445 | 651 | 829 | ok | 429 | 829 | ok | 600 | 829 | ok | 1024 | 1256 | ok | 275 | 628 | ok | 772 | 1256 | ok | 798 | 1005 | ok | 747 | 1005 | ok | 856 | 1005 | ok |
| | FB2/FB69 | 200X450 | 2.93 | 670 | 829 | ok | 391 | 829 | ok | 699 | 829 | ok | 491 | 1256 | ok | 500 | 829 | ok | 1157 | 829 | Not ok | 1030 | 1005 | Not ok | 1103 | 1005 | Not ok | 1124 | 1005 | Not ok |
| | FB3/FB70 | 200X450 | 2.93 | 687 | 829 | ok | 385 | 829 | ok | 690 | 829 | ok | 1185 | 1256 | ok | 512 | 829 | ok | 482 | 829 | ok | 1156 | 1005 | Not ok | 1136 | 1005 | Not ok | 1035 | 1005 | Not ok |
| | FB4/FB71 | 200X450 | 4.445 | 592 | 829 | ok | 425 | 829 | ok | 658 | 829 | ok | 784 | 1256 | ok | 271 | 628 | ok | 1006 | 1256 | ok | 852 | 1005 | ok | 732 | 1005 | ok | 784 | 1005 | ok |
| | FB5/FB64 | 200X500 | 5.045 | 267 | 402 | ok | 435 | 716 | ok | 237 | 402 | ok | 150 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 316 | 1005 | ok | 221.69 | 502 | ok | 221.69 | 1005 | ok |
| | FB6/FB65 | 200X500 | 3.53 | 188 | 402 | ok | 246 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 221.69 | 1005 | ok | 221.69 | 502 | ok | 221.69 | 1005 | ok |
| | FB7/FB66 | 200X500 | 3.53 | 150 | 402 | ok | 244 | 603 | ok | 189 | 402 | ok | 150 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 221.69 | 1005 | ok | 221.69 | 502 | ok | 221.69 | 1005 | ok |
| | FB8/FB67 | 200X500 | 5.045 | 231 | 402 | ok | 434 | 716 | ok | 314 | 402 | ok | 150 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 221.69 | 1005 | ok | 221.69 | 502 | ok | 221.69 | 1005 | ok |
| | FB9/FB58 | 200X500 | 5.045 | 647 | 1608 | ok | 573 | 1608 | ok | 424 | 1608 | ok | 1294 | 1608 | ok | 337 | 628 | ok | 324 | 1608 | ok | 800 | 1005 | ok | 673 | 628 | Not ok | 1021 | 1005 | Not ok |
| | FB10/FB59 | 200X500 | 3.53 | 231 | 1608 | ok | 231 | 1608 | ok | 316 | 1922 | ok | 150 | 1608 | ok | 150 | 1608 | ok | 150 | 1608 | ok | 805 | 1005 | ok | 316.63 | 628 | ok | 1366 | 1005 | Not ok |
| | FB11/FB60 | 200X450 | 3.73 | 473 | 1922 | ok | 510 | 942 | ok | 636 | 942 | ok | 297 | 1608 | ok | 588 | 628 | ok | 1005 | 1608 | ok | 326.23 | 1005 | ok | 384.3 | 628 | ok | 414 | 1005 | ok |
| | FB19 | 200X500 | 2.73 | 678 | 942 | ok | 287 | 942 | ok | 724 | 942 | ok | 858 | 1118 | ok | 247 | 1118 | ok | 804 | 1118 | ok | 1069 | 1005 | Not ok | 956 | 1005 | ok | 1057 | 1005 | Not ok |
| | FB12/FB61 | 200X450 | 3.73 | 672 | 1922 | ok | 520 | 942 | ok | 367 | 942 | ok | 1096 | 1608 | ok | 646 | 628 | Not ok | 297 | 1608 | ok | 435 | 1005 | ok | 408 | 628 | ok | 325 | 1005 | ok |
| | FB13/FB62 | 200X500 | 3.53 | 497 | 1608 | ok | 231 | 1608 | ok | 231 | 1992 | ok | 506 | 1608 | ok | 231 | 1608 | ok | 459 | 1608 | ok | 1572 | 1005 | Not ok | 332 | 628 | ok | 1254 | 1005 | Not ok |
| | FB14/FB63 | 200X500 | 5.045 | 416 | 1608 | ok | 591 | 1608 | ok | 624 | 1608 | ok | 312 | 1608 | ok | 314 | 628 | ok | 1248 | 1608 | ok | 920 | 1005 | ok | 650 | 628 | Not ok | 775 | 1005 | ok |
| | FB15/FB56 | 200X500 | 3.73 | 150 | 628 | ok | 576 | 628 | ok | 606 | 829 | ok | 150 | 628 | ok | 851 | 628 | Not ok | 1205 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB16/FB57 | 200X500 | 3.73 | 622 | 628 | ok | 591 | 628 | ok | 150 | 829 | ok | 1392 | 628 | Not ok | 887 | 628 | Not ok | 150 | 1432 | ok | 221.69 | 558 | ok | 221.69 | 558 | ok | 221.69 | 1005 | ok |
| | FB17/FB54 | 200X500 | 5.045 | 298 | 628 | ok | 544 | 1256 | ok | 353 | 628 | ok | 150 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 325 | 1005 | ok | 221 | 558 | ok | 331 | 1005 | ok |
| | FB18/FB55 | 200X500 | 5.045 | 340 | 628 | ok | 546 | 1256 | ok | 315 | 628 | ok | 150 | 603 | ok | 150 | 402 | ok | 150 | 603 | ok | 338 | 1005 | ok | 221.69 | 558 | ok | 350 | 1005 | ok |
| | FB20/FB50 | 200X500 | 5.045 | 628 | 628 | ok | 547 | 1256 | ok | 506 | 628 | ok | 1257 | 1256 | Not ok | 339 | 628 | ok | 356 | 1256 | ok | 884 | 1005 | ok | 843 | 628 | Not ok | 830 | 1005 | ok |
| | FB21/FB51 | 200X500 | 3.53 | 1100 | 628 | Not ok | 696 | 942 | ok | 825 | 628 | Not ok | 690 | 1256 | ok | 716 | 628 | Not ok | 1649 | 1256 | Not ok | 1194 | 1005 | Not ok | 1509 | 628 | Not ok | 1541 | 1005 | Not ok |
| | FB24/FB47 | 200X500 | 3.73 | 1161 | 628 | Not ok | 501 | 628 | ok | 501 | 628 | ok | 923 | 942 | ok | 478 | 628 | ok | 902 | 1256 | ok | 913 | 1005 | ok | 1036 | 628 | Not ok | 1066 | 1005 | Not ok |
| | FB25/FB48 | 200X500 | 2.73 | 414 | 628 | ok | 291 | 942 | ok | 359 | 628 | ok | 686 | 1256 | ok | 393 | 1256 | ok | 673 | 1256 | ok | 816 | 1005 | ok | 730 | 1005 | ok | 877 | 1005 | ok |
| | FB26/FB49 | 200X500 | 3.73 | 523 | 628 | ok | 570 | 628 | ok | 1162 | 628 | Not ok | 1046 | 1256 | ok | 490 | 628 | ok | 990 | 942 | Not ok | 1137 | 1005 | Not ok | 1075 | 628 | Not ok | 961 | 1005 | ok |
| | FB22/FB52 | 200X500 | 3.53 | 887 | 628 | Not ok | 699 | 942 | ok | 1097 | 628 | Not ok | 1685 | 1256 | Not ok | 741 | 628 | Not ok | 683 | 1256 | ok | 1590 | 1005 | Not ok | 1560 | 628 | Not ok | 1222 | 1005 | Not ok |
| | FB23/FB53 | 200X500 | 5.045 | 493 | 628 | ok | 524 | 1256 | ok | 618 | 628 | ok | 367 | 1256 | ok | 324 | 628 | ok | 1236 | 1256 | ok | 818 | 1005 | ok | 836 | 628 | Not ok | 878 | 1005 | ok |
| | FB32/FB43 | 200X500 | 3.53 | 367 | 1030 | ok | 416 | 1030 | ok | 150 | 1030 | ok | 181 | 628 | ok | 166 | 628 | ok | 258 | 628 | ok | 221.69 | 558 | ok | 335.61 | 558 | ok | 860 | 1005 | ok |
| | FB33/FB44 | 200X500 | 3.53 | 231 | 1030 | ok | 629 | 1030 | ok | 1067 | 1030 | Not ok | 265 | 628 | ok | 324 | 628 | ok | 842 | 628 | Not ok | 974 | 558 | Not ok | 338 | 558 | ok | 221.69 | 1005 | ok |
| | FB29 | 200X500 | 1.945 | 518 | 980 | ok | 1207 | 1470 | ok | 1624 | 1470 | Not ok | 518 | 1470 | ok | 1542 | 2450 | ok | 2071 | 2450 | ok | 386 | 1005 | ok | 980 | 1005 | ok | 338 | 1005 | ok |
| | FB31 | 200X500 | 1.945 | 518 | 1470 | ok | 1207 | 1470 | ok | 1624 | 980 | Not ok | 518 | 2450 | ok | 1542 | 2450 | ok | 2071 | 1470 | Not ok | 386 | 1005 | ok | 980 | 1005 | ok | 338 | 1005 | ok |
| | FB38 | 200X500 | 1.945 | 1663 | 2940 | ok | 1244 | 2940 | ok | 523 | 2940 | ok | 2091 | 2940 | ok | 1573 | 2940 | ok | 523 | 2940 | ok | 1809 | 1570 | Not ok | O/S | 1570 | Not ok | O/S | 1570 | Not ok |
| | FB42 | 200X500 | 1.945 | 1663 | 2940 | ok | 1244 | 2940 | ok | 523 | 2940 | ok | 2091 | 2940 | ok | 1573 | 2940 | ok | 523 | 2940 | ok | O/S | 1570 | Not ok | O/S | 1570 | Not ok | 1867 | 1570 | Not ok |
| | FB39/FB41 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 597 | 1570 | ok | 630 | 1570 | ok | 600 | 1570 | ok |
| | FB30/FB40 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 231 | 2450 | ok | 597 | 1005 | ok | 600 | 1005 | ok | 603 | 1005 | ok |
| | FB45/FB46 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB34/FB36 | 200X500 | 3.135 | 1037 | 942 | Not ok | 601 | 942 | ok | 231 | 942 | ok | 820 | 1118 | ok | 307 | 1118 | ok | 262 | 1118 | ok | 653 | 1005 | ok | 782 | 628 | Not ok | 806 | 1005 | ok |
| | FB35/FB37 | 200X500 | 3.135 | 231 | 942 | ok | 629 | 942 | ok | 1067 | 942 | Not ok | 265 | 1118 | ok | 324 | 1118 | ok | 842 | 1118 | ok | 843 | 1005 | ok | 792 | 628 | Not ok | 646 | 1005 | ok |
| | FB27/FB28 | 200X450 | 1.605 | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 133 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB74/FB137/FB139 | 200X500 | 3.135 | 323 | 942 | ok | 300 | 942 | ok | 330 | 942 | ok | 466 | 1118 | ok | 231 | 1118 | ok | 322 | 1118 | ok | 805 | 1005 | ok | 525 | 628 | ok | 568 | 1005 | ok |
| | FB73/FB138 | 200X500 | 3.271 | 347 | 716 | ok | 424 | 716 | ok | 515 | 716 | ok | 539 | 628 | ok | 347 | 628 | ok | 448 | 1608 | ok | 840 | 1005 | ok | 737 | 628 | Not ok | 935 | 1005 | ok |
| | FB75/FB140/FB72/FB137 | 200X500 | 3.135 | 325 | 603 | ok | 317 | 603 | ok | 336 | 603 | ok | 325 | 942 | ok | 231 | 942 | ok | 447 | 942 | ok | 572 | 1005 | ok | 490 | 628 | ok | 790 | 1005 | ok |
| | FB78/FB133 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB91/FB120/FB121/FB92 | 150x450 | 1.6 | 99 | 226 | ok | 107 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 99 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB76/FB135/FB77/FB136 | 150X500 | 1.5 | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 112 | 226 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok | 166.27 | 670 | ok |
| | FB80/FB131/FB132/FB81 | 200X500 | 1.5 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB79/FB134 | 200X500 | 1.6 | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 150 | 402 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB86/FB122 | 200X500 | 5.03 | 502 | 1118 | ok | 534 | 1118 | ok | 251 | 1118 | ok | 1003 | 1608 | ok | 251 | 628 | ok | 317 | 1256 | ok | 1040 | 1005 | Not ok | 875 | 628 | Not ok | 807 | 1005 | ok |
| | FB84/FB127 | 200X500 | 3.376 | 150 | 1256 | ok | 312 | 1256 | ok | 269 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 221.69 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB82/FB129 | 200X450 | 4.39 | 133 | 402 | ok | 274 | 716 | ok | 252 | 402 | ok | 133 | 402 | ok | 376 | 402 | ok | 1200 | 716 | Not ok | 221.69 | 502 | ok | 243 | 502 | ok | 246 | 1005 | ok |
| | FB83/FB130 | 200X450 | 4.39 | 273 | 402 | ok | 283 | 716 | ok | 146 | 402 | ok | 1145 | 402 | Not ok | 309 | 402 | ok | 133 | 716 | ok | 310 | 502 | ok | 246 | 502 | ok | 221.69 | 1005 | ok |
| | FB85/FB128 | 200X500 | 3.376 | 252 | 1256 | ok | 295 | 1256 | ok | 150 | 1256 | ok | 150 | 942 | ok | 150 | 942 | ok | 150 | 942 | ok | 286 | 1005 | ok | 221.69 | 628 | ok | 221.69 | 1005 | ok |
| | FB90/FB126 | 200X575 | 5.03 | 250 | 1118 | ok | 536 | 1118 | ok | 501 | 1118 | ok | 259 | 1608 | ok | 250 | 628 | ok | 1002 | 1256 | ok | 743 | 1005 | ok | 874 | 628 | Not ok | 1030 | 1005 | Not ok |
| | FB97/FB109 | 200X500 | 3.83 | 322 | 628 | ok | 306 | 628 | ok | 231 | 628 | ok | 501 | 1256 | ok | 231 | 1256 | ok | 419 | 1256 | ok | 476 | 1005 | ok | 350 | 1005 | ok | 474 | 1005 | ok |
| | FB98/FB110 | 200X500 | 4.776 | 318 | 628 | ok | 492 | 942 | ok | 340 | 628 | ok | 383 | 1256 | ok | 231 | 628 | ok | 470 | 1256 | ok | 676 | 1005 | ok | 384 | 628 | ok | 512 | 1005 | ok |
| | FB99/FB111 | 200X500 | 2.539 | 791 | 628 | Not ok | 281 | 628 | ok | 271 | 628 | ok | 424 | 1256 | ok | 367 | 1256 | ok | 763 | 1256 | ok | 431 | 1005 | ok | 709 | 1005 | ok | 1042 | 1005 | Not ok |
| | FB100/FB112 | 200X500 | 2.675 | 244 | 628 | ok | 231 | 628 | ok | 364 | 628 | ok | 487 | 1256 | ok | 270 | 1256 | ok | 729 | 1256 | ok | 987 | 1005 | ok | 431 | 1005 | ok | 827 | 1005 | ok |
| | FB101/FB113 | 200X500 | 2.505 | 382 | 628 | ok | 303 | 628 | ok | 509 | 628 | ok | 763 | 1256 | ok | 359 | 1256 | ok | 249 | 1256 | ok | 968 | 1005 | ok | 633 | 1005 | ok | 438 | 1005 | ok |
| | FB102/FB114 | 200X500 | 4.876 | 235 | 628 | ok | 473 | 942 | ok | 265 | 628 | ok | 440 | 1256 | ok | 231 | 628 | ok | 273 | 1256 | ok | 560 | 1005 | ok | 447 | 628 | ok | 269 | 1005 | ok |
| | FB103/FB115 | 200X500 | 3.83 | 231 | 628 | ok | 302 | 628 | ok | 350 | 628 | ok | 364 | 1256 | ok | 231 | 1256 | ok | 494 | 1256 | ok | 869 | 1005 | ok | 390 | 1005 | ok | 484 | 1005 | ok |
| | FB104/FB108 | 200X500 | 1.3 | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 231 | 1470 | ok | 610 | 1005 | ok | 620 | 1005 | ok | 600 | 1005 | ok |
| | FB106 | 150x500 | 1.385 | 112 | 402 | ok | 175 | 402 | ok | 256 | 402 | ok | 112 | 226 | ok | 184 | 226 | ok | 294 | 226 | Not ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok |
| | FB105/FB107 | 200X500 | 1.865 | 926 | 1470 | ok | 857 | 1470 | ok | 953 | 1470 | ok | 1124 | 1470 | ok | 1005 | 1470 | ok | 757 | 1470 | ok | 1715 | 1005 | Not ok | 1807 | 1005 | Not ok | 1704 | 1005 | Not ok |
| | FB87/FB123 | 250X450 | 4.29 | 490 | 1256 | ok | 355 | 1256 | ok | 709 | 1256 | ok | 355 | 1960 | ok | 355 | 980 | ok | 1419 | 1960 | ok | 795 | 837 | ok | 1002 | 628 | Not ok | 1266 | 837 | Not ok |
| | FB89/FB125 | 250X450 | 4.29 | 711 | 1256 | ok | 356 | 1256 | ok | 492 | 1256 | ok | 1423 | 1960 | ok | 356 | 980 | ok | 356 | 1960 | ok | 1206 | 837 | Not ok | 936 | 628 | Not ok | 783 | 837 | ok |
| | FB88/FB124 | 250X450 | 1.93 | 509 | 628 | ok | 256 | 628 | ok | 524 | 628 | ok | 870 | 2588 | ok | 474 | 2588 | ok | 895 | 2588 | ok | 1192 | 1005 | Not ok | 1233 | 1005 | Not ok | 1284 | 1005 | Not ok |
| | FB93/FB94/FB118/FB119 | 150x300 | 0.78 | 61 | 226 | ok | 61 | 226 | ok | 61 | 226 | ok | 106 | 226 | ok | 61 | 226 | ok | 117 | 226 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok | 166.27 | 502 | ok |
| | FB95/FB96/FB116/FB117 | 200x300 | 82 | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 82 | 226 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok | 221.69 | 502 | ok |
| | FB89 | 300X500 | 0.4 | 224 | 1256 | ok | 224 | 1256 | ok | 224 | 1256 | ok | 314 | 1960 | ok | 224 | 1960 | ok | 224 | 1960 | ok | 533.92 | 1005 | ok | 496.66 | 1005 | ok | 496.66 | 1005 | ok |

# Requirement of Beam Strengthening due to Distress

**Annexure-17A**

| Grid | Beam | BF | GF | 1F | 2F | 3F | 4F | 5F | 6F | 7F | 8F | 9F | 10F | 11F | 12F | 13F | 14F | 15F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1c/Ac-Bc | FB1 | | | | | | | | | | | | | | | | | |
| 1c/Bc-Cc | FB2 | | | | | | | | | | | | | | | | | |
| 1c/Cc-Kc | FB3 | | | | | | | | | | | | | | | | | |
| 1c/Kc-Lc | FB4 | | | | | | | | | | | | | | | | | |
| 1c/Lc-Mc | FB5 | | | | | | | | | | | | | | | | | |
| 2c/Ac-Bc | FB8 | | | | | | | | | | | | | | | | | |
| 2c/Bc-Cc | FB9 | | | | | | | | | | | | | | | | | |
| 2c/Cc-Ec | FB10 | | | | | | | | | | | | | | | | | |
| Mid Landing | FB11 | | | | | | | | | | | | | | | | | |
| 2c/Hc-Kc | FB12 | | | | | | | | | | | | | | | | | |
| 2c/Kc-Lc | FB13 | | | | | | | | | | | | | | | | | |
| 2c/Lc-Mc | FB14 | | | | | | | | | | | | | | | | | |
| 3c/Ac-Bc | FB17 | | | | | | | | | | | | | | | | | |
| 3c/Bc-Cc | FB18 | | | | | | | | | | | | | | | | | |
| 3c/Ec-Hc | FB20 | | | | | | | | | | | | | | | | | |
| 3c/Hc-Kc | FB21 | | | | | | | | | | | | | | | | | |
| 3c/Kc-Lc | FB22 | | | | | | | | | | | | | | | | | |
| 3c/Lc-Mc | FB23 | | | | | | | | | | | | | | | | | |
| 4c/Cc-Dc | FB24 | | | | | | | | | | | | | | | | | |
| 4c/Fc-Gc | FB25 | | | | | | | | | | | | | | | | | |
| 4c/Jc-Kc | FB26 | | | | | | | | | | | | | | | | | |
| 6c/Ac-Bc | FB29 | | | | | | | | | | | | | | | | | |
| 6c/Bc-Cc | FB30 | | | | | | | | | | | | | | | | | |
| 6c/Kc-Lc | FB31 | | | | | | | | | | | | | | | | | |
| 6c/Lc-Mc | FB32 | | | | | | | | | | | | | | | | | |
| 8c/Ac-Bc | FB33 | | | | | | | | | | | | | | | | | |
| 8c/Bc-Cc | FB34 | | | | | | | | | | | | | | | | | |
| 8c/Kc-Lc | FB35 | | | | | | | | | | | | | | | | | |
| 8c/Lc-Mc | FB36 | | | | | | | | | | | | | | | | | |
| 9c/Bc-Cc | FB37 | | | | | | | | | | | | | | | | | |
| 9c/Cc-Dc | FB38 | | | | | | | | | | | | | | | | | |
| 9c/Dc-Ec | FB39 | | | | | | | | | | | | | | | | | |
| 9c/Fc-Gc | FB40 | | | | | | | | | | | | | | | | | |
| 9c/Gc-Jc | FB41 | | | | | | | | | | | | | | | | | |
| 9c/Jc-Kc | FB42 | | | | | | | | | | | | | | | | | |
| 9c/Kc-Lc | FB43 | | | | | | | | | | | | | | | | | |
| 10c/Ac-Bc | FB45 | | | | | | | | | | | | | | | | | |
| 10c/Bc-Cc | FB46 | | | | | | | | | | | | | | | | | |
| 10c/Cc-Ec | FB47 | | | | | | | | | | | | | | | | | |
| 10c/Hc-Kc | FB48 | | | | | | | | | | | | | | | | | |
| 10c/Kc-Lc | FB49 | | | | | | | | | | | | | | | | | |
| 10c/Lc-Mc | FB50 | | | | | | | | | | | | | | | | | |
| 11c/Ac-Bc | FB53 | | | | | | | | | | | | | | | | | |
| 11c/Bc-Cc | FB54 | | | | | | | | | | | | | | | | | |
| 11c/Cc-Ec | FB55 | | | | | | | | | | | | | | | | | |
| Mid landing | FB 56 | | | | | | | | | | | | | | | | | |
| 11c/Hc-Kc | FB57 | | | | | | | | | | | | | | | | | |
| 11c/Kc-Lc | FB58 | | | | | | | | | | | | | | | | | |
| 11c/Lc-Mc | FB59 | | | | | | | | | | | | | | | | | |
| 12c/Ac-Bc | FB62 | | | | | | | | | | | | | | | | | |
| 12c/Bc-Cc | FB63 | | | | | | | | | | | | | | | | | |
| 12c/Cc-Kc | FB64 | | | | | | | | | | | | | | | | | |
| 12c/Kc-Lc | FB65 | | | | | | | | | | | | | | | | | |
| 12c/Lc-Mc | FB66 | | | | | | | | | | | | | | | | | |
| Ac/11c-12c | FB67 | | | | | | | | | | | | | | | | | |
| Ac/10c-11c | FB68 | | | | | | | | | | | | | | | | | |
| Ac/3c-10c | FB69 | | | | | | | | | | | | | | | | | |
| Ac/2c-3c | FB70 | | | | | | | | | | | | | | | | | |
| Ac/1c-2c | FB71 | | | | | | | | | | | | | | | | | |
| Bc/11c-12c | FB76 | | | | | | | | | | | | | | | | | |
| Bc/10c-11c | FB77 | | | | | | | | | | | | | | | | | |
| Bc/8c-10c | FB78 | | | | | | | | | | | | | | | | | |
| Bc/3c-5c | FB79 | | | | | | | | | | | | | | | | | |
| Bc/2c-3c | FB80 | | | | | | | | | | | | | | | | | |
| Bc/1c-2c | FB81 | | | | | | | | | | | | | | | | | |
| West Refuge Area | FB86 | | | | | | | | | | | | | | | | | |
| Cc/11c-12c | FB90 | | | | | | | | | | | | | | | | | |
| Cc/10c-11c | FB91 | | | | | | | | | | | | | | | | | |
| Cc/8c-10c | FB92 | | | | | | | | | | | | | | | | | |
| Cc/6c-8c | FB93 | | | | | | | | | | | | | | | | | |
| Cc/3c-5c | FB94 | | | | | | | | | | | | | | | | | |
| Cc/2c-3c | FB95 | | | | | | | | | | | | | | | | | |
| Cc/1c-2c | FB96 | | | | | | | | | | | | | | | | | |
| Dc/4c-7c | FB97 | | | | | | | | | | | | | | | | | |
| Ec/11c-12c | FB98 | | | | | | | | | | | | | | | | | |
| Ec/3c-4c | FB99 | | | | | | | | | | | | | | | | | |
| Ec/1c-2c | FB100 | | | | | | | | | | | | | | | | | |
| Hc/11c-12c | FB101 | | | | | | | | | | | | | | | | | |
| Hc/3c-4c | FB103 | | | | | | | | | | | | | | | | | |
| Hc/1c-2c | FB104 | | | | | | | | | | | | | | | | | |
| Jc/4c-6c | FB105 | | | | | | | | | | | | | | | | | |
| Kc/11c-12c | FB106 | | | | | | | | | | | | | | | | | |
| Kc/10c-11c | FB107 | | | | | | | | | | | | | | | | | |
| Kc/8c-10c | FB108 | | | | | | | | | | | | | | | | | |
| Kc/6c-8c | FB109 | | | | | | | | | | | | | | | | | |
| Kc/3c-5c | FB110 | | | | | | | | | | | | | | | | | |
| Kc/2c-3c | FB111 | | | | | | | | | | | | | | | | | |
| Kc/1c-2c | FB112 | | | | | | | | | | | | | | | | | |
| Duct Beam | FB118 | | | | | | | | | | | | | | | | | |
| Lc/11c-12c | FB119 | | | | | | | | | | | | | | | | | |
| Lc/10c-11c | FB120 | | | | | | | | | | | | | | | | | |
| Lc/8c-10c | FB121 | | | | | | | | | | | | | | | | | |
| Mid Landing | FB122 | | | | | | | | | | | | | | | | | |
| Lc/3c-5c | FB123 | | | | | | | | | | | | | | | | | |
| Lc/2c-3c | FB124 | | | | | | | | | | | | | | | | | |
| Lc/1c-2c | FB125 | | | | | | | | | | | | | | | | | |
| Duct Beam | FB126 | | | | | | | | | | | | | | | | | |
| Mc/11c-12c | FB131 | | | | | | | | | | | | | | | | | |
| Mc/10c-11c | FB132 | | | | | | | | | | | | | | | | | |
| Mc/3c-10c | FB133 | | | | | | | | | | | | | | | | | |
| Mc/2c-3c | FB134 | | | | | | | | | | | | | | | | | |
| Mc/1c-2c | FB135 | | | | | | | | | | | | | | | | | |

# Slabs to be Strenghened due to Distress- Floor-wise



## Tower C - Details of the Slab to be strengthened Due to Distress

| | Slab No | S3 | | | | S4 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ground Floor | Grid | Cc-Ec/11c-12c | | Hc-Kc/11c-12c | | Ec-Hc/11c-12c | | Ec-Hc/1c-2c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S7 | | | | S14 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ground Floor | Grid | Cc-Ec/10c-11c | | Hc-Kc/10c-11c | | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S15 | | S16 | | S17 | | S21 | |
|---|---|---|---|---|---|---|---|---|---|
| Ground Floor | Grid | Cc-kc/9c-10c | | Cc-Ec/4c | | Hc-Kc/3c-4c | | Cc/5c-8c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S22 | | S23 | |
|---|---|---|---|---|---|
| Ground Floor | Grid | Kc-Lc/5c-8c | | Ec-Hc/3c-4c | |
| | | Top | Bot | Top | Bot |
| | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | Slab No | S12 | | S8 | | | | S23 | |
|---|---|---|---|---|---|---|---|---|---|
| 1st Floor | Grid | Hc-Kc/10c-11c | | Bc-Cc/10c-11c | | Kc-Lc/10c-11c | | Ec-Hc/3c-4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S22 | | S21 | | | | S13 | |
|---|---|---|---|---|---|---|---|---|---|
| 1st Floor | Grid | Kc-Lc/5c-8c | | Cc-Ec/4c | | Hc-Kc/4c | | Cc-Kc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S20 | | | | S5 | | S7 | |
|---|---|---|---|---|---|---|---|---|---|
| 1st Floor | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Ac-Bc/11c-12c | | Ac-Bc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | Slab No | S17 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2nd Floor | Grid | Bc-Cc/3c-4c | | Kc-Lc/3c-4c | | Bc-Cc/9c-10c | | Kc-Lc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2nd Floor | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S23 | | S12 | | S9 | | S17 | |
|---|---|---|---|---|---|---|---|---|---|
| 2nd Floor | Grid | Ec-Hc/3c | | Cc-Ec/2c-3c | | Cc-Ec/2c | | Kc-Lc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S8 | | | | S7 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2nd Floor | Grid | Bc-Cc/2c-3c | | Kc-Lc/2c-3c | | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S5 | |
|---|---|---|---|
| 2nd Floor | Grid | Lc-Mc/11c-12c | |
| | | Top | Bot |
| | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | Slab No | S12 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3rd Floor | Grid | Cc-Ec/2c-3c | | Hc-Kc/2c-3c | | Cc-Ec/10c-11c | | Hc-Kc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3rd Floor | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S23 | | S12 | | S9 | | S3 | |
|---|---|---|---|---|---|---|---|---|---|
| 3rd Floor | Grid | Ec-Hc/3c | | Cc-Ec/2c-3c | | Hc-Kc/2c | | Kc-Lc/1c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S8 | | | | S7 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3rd Floor | Grid | Bc-Cc/10c-11c | | Kc-Lc/10c-11c | | Lc-Mc/2c-3c | | Lc-Mc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S5 | | | | S22 | |
|---|---|---|---|---|---|---|---|
| 3rd Floor | Grid | Ac-Bc/11c-12c | | Lc-Mc/11c-12c | | Ec-Hc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4rd Floor | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S22 | | S23 | | S12 | |
|---|---|---|---|---|---|---|---|
| 4rd Floor | Grid | Ec-Hc/4c | | Ec-Hc/3c | | Hc-Kc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| | Slab No | S17 | | | | S8 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4rd Floor | Grid | Kc-Lc/3c-4c | | Kc-Lc/9c-10c | | Bc-Cc/10c-11c | | Kc-Lc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S5 | | S6 | | S19 | |
|---|---|---|---|---|---|---|---|
| 4rd Floor | Grid | Lc-Mc/11c-12c | | Kc-Lc/11c-12c | | Bc-Cc/6c-8c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5th Floor | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S22 | | S23 | | S12 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5th Floor | Grid | Ec-Hc/4c | | Ec-Hc/3c | | Hc-Kc/2c-3c | | Hc-Kc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S17 | | | | S7 | |
|---|---|---|---|---|---|---|---|
| 5th Floor | Grid | Kc-Lc/3c-4c | | Kc-Lc/9c-10c | | Bc-Cc/9c-10c | | Lc-Mc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S5 | | | | S8 | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5th Floor | Grid | Ac-Bc/11c-12c | | Lc-Mc/11c-12c | | Bc-Cc/10c-11c | | Kc-Lc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| | Slab No | S7 | | |
|---|---|---|---|---|
| 5th Floor | Grid | Ac-Bc/10c-11c | | Lc-Mc/10c-11c |
| | | Top | Bot | Top | Bot |
| | | | | | |

# Slabs to be Strenghened due to Distress- Floor-wise



## Tower C - Details of the Slab to be strengthened Due to Distress

| 6th Floor | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 6th Floor | Slab No | S22 | | S23 | | S12 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ec-Hc/4c | | Ec-Hc/3c | | Hc-Kc/2c-3c | | Hc-Kc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 6th Floor | Slab No | S17 | | | | S7 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Kc-Lc/3c-4c | | Kc-Lc/9c-10c | | Bc-Cc/9c-10c | | Lc-Mc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 6th Floor | Slab No | S5 | | | | S8 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ac-Bc/11c-12c | | Lc-Mc/11c-12c | | Bc-Cc/10c-11c | | Kc-Lc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 6th Floor | Slab No | S7 | | |
|---|---|---|---|---|
| | Grid | Ac-Bc/10c-11c | | Lc-Mc/10c-11c |
| | | Top | Bot | Top | Bot |
| | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| 8th Floor | Slab No | S20 | | | | S21 | | S13 | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Hc-Kc/3c-4c | | Cc-Kc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 8th Floor | Slab No | S22 | | S23 | | S8 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ec-Hc/4c | | Ec-Hc/3c | | Bc-Cc/2c-3c | | Kc-Lc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 8th Floor | Slab No | S8 | | S1 | | S9 | | S7 | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Kc-Lc/10c-11c | | Ac/1c | | Hc-Kc/2c | | Ac-Bc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 8th Floor | Slab No | S12 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Ec/2c-3c | | Hc-Kc/2c-3c | | Cc-Ec/10c-11c | | Hc-Kc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 8th Floor | Slab No | S5 | | | |
|---|---|---|---|---|---|
| | Grid | Ac-Bc/1c-2c | | Lc-Mc/1c-2c | |
| | | Top | Bot | Top | Bot |
| | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| 10th Floor | Slab No | S13 | | S8 | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Cc-Kc/9c-10c | | Bc-Cc/10c-11c | | Kc-Lc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| 10th Floor | Slab No | S17 | | | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Kc-Lc/3c-4c | | Bc-Cc/9c-10c | | Kc-Lc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| 10th Floor | Slab No | S7 | | | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Lc-Mc/2c-3c | | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| 10th Floor | Slab No | S5 | | | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Lc-Mc/1c-2c | | Ac-Bc/11c-12c | | Lc-Mc/11c-12c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| 7th Floor | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 7th Floor | Slab No | S22 | | S23 | | S8 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ec-Hc/4c | | Ec-Hc/3c | | Bc-Cc/10c-11c | | Bc-Cc/2c-3c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 7th Floor | Slab No | S12 | | | | S13 | |
|---|---|---|---|---|---|---|---|
| | Grid | Cc-Ec/2c-3c | | Cc-Ec/10c-11c | | Hc-Kc/10c-11c | | Cc-Kc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 7th Floor | Slab No | S7 | | S3 | |
|---|---|---|---|---|---|
| | Grid | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | | Kc-Lc/12c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| 9th Floor | Slab No | S20 | | | | S21 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 9th Floor | Slab No | S22 | | S23 | | S2 | | S9 | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ec-Hc/4c | | Ec-Hc/3c | | Lc/12c | | Hc-Kc/2c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 9th Floor | Slab No | S17 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Bc-Cc/3c-4c | | Kc-Lc/3c-4c | | Bc-Cc/9c-10c | | Kc-Lc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 9th Floor | Slab No | S12 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Ec/2c-3c | | Hc-Kc/2c-3c | | Cc-Ec/10c-11c | | Hc-Kc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 9th Floor | Slab No | S8 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Bc-Cc/2c-3c | | Kc-Lc/2c-3c | | Bc-Cc/10c-11c | | Kc-Lc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 9th Floor | Slab No | S5 | | | | |
|---|---|---|---|---|---|---|
| | Grid | Ac-Bc/1c-2c | | Lc-Mc/1c-2c | | Ac-Bc/11c-12c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| 9th Floor | Slab No | S7 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ac-Bc/2c-3c | | Lc-Mc/2c-3c | | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| 11th Floor | Slab No | S20 | | | | S21 | | S13 | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Hc-Kc/3c-4c | | Cc-Kc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 11th Floor | Slab No | S22 | | S8 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grid | Ec-Hc/4c | | Bc-Cc/2c-3c | | Kc-Lc/2c-3c | | Kc-Lc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

| 11th Floor | Slab No | S17 | | | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Kc-Lc/3c-4c | | Bc-Cc/9c-10c | | Kc-Lc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| 11th Floor | Slab No | S7 | | | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Lc-Mc/2c-3c | | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

| 11th Floor | Slab No | S5 | | | | | |
|---|---|---|---|---|---|---|---|
| | Grid | Lc-Mc/1c-2c | | Ac-Bc/11c-12c | | Lc-Mc/11c-12c | |
| | | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | |

# Slabs to be Strenghened due to Distress- Floor-wise



## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12th Floor | Slab No | S20 | | | | S21 | | | |
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 12th Floor | Slab No | S22 | | S13 | | S5 | | | |
| | Grid | Ec-Hc/4c | | Cc-Kc/8c-10c | | Lc-Mc/1c-2c | | Ac-Bc/11c-12c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 12th Floor | Slab No | S17 | | | | | | | |
| | Grid | Bc-Cc/3c-4c | | Kc-Lc/3c-4c | | Bc-Cc/9c-10c | | Kc-Lc/9c-10c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 12th Floor | Slab No | S8 | | | | S12 | | | |
| | Grid | Bc-Cc/2c-3c | | Kc-Lc/2c-3c | | Hc-Kc/10c-11c | | | |
| | | Top | Bot | Top | Bot | Top | Bot | | |
| | | | | | | | | | |
| 12th Floor | Slab No | S7 | | | | | | | |
| | Grid | Ac-Bc/2c-3c | | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | | | |
| | | Top | Bot | Top | Bot | Top | Bot | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13th Floor | Slab No | S20 | | | | S21 | | | |
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 13th Floor | Slab No | S22 | | S13 | | S5 | | | |
| | Grid | Ec-Hc/4c | | Cc-Kc/8c-10c | | Lc-Mc/1c-2c | | Ac-Bc/11c-12c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 13th Floor | Slab No | S7 | | | | | | | |
| | Grid | Lc-Mc/2c-3c | | Ac-Bc/10c-11c | | Lc-Mc/10c-11c | | | |
| | | Top | Bot | Top | Bot | Top | Bot | | |
| | | | | | | | | | |
| 13th Floor | Slab No | S8 | | S12 | | | | | |
| | Grid | Bc-Cc/10c-11c | | Hc-Kc/10c-11c | | | | | |
| | | Top | Bot | Top | Bot | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | |
|---|---|---|---|---|
| 15th Floor | Slab No | S17 | | |
| | Grid | Bc-Cc/3c-4c | | |
| | | Top | Bot | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14th Floor | Slab No | S20 | | | | S21 | | | |
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 14th Floor | Slab No | S23 | | S1 | | S5 | | | |
| | Grid | Ec-Hc/3c | | Mc/1c | | Lc-Mc/1c-2c | | Ac-Bc/11c-12c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 14th Floor | Slab No | S7 | | S8 | | S12 | | S17 | |
| | Grid | Ac-Bc/2c-3c | | Bc-Cc/10c-11c | | Hc-Kc/10c-11c | | Bc-Cc/3c-4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16th Floor | Slab No | S5 | | | | S7 | | | |
| | Grid | Ac-Bc/11c-12c | | Lc-Mc/11c-12c | | Lc-Mc/2c-3c | | Lc-Mc/10c-11c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 16th Floor | Slab No | S20 | | | | S21 | | | |
| | Grid | Cc-Dc/4c-9c | | Jc-Kc/4c-9c | | Cc-Ec/4c | | Hc-Kc/4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |
| 16th Floor | Slab No | S12 | | S8 | | S17 | | | |
| | Grid | Hc-Kc/10c-11c | | Kc-Lc/10c-11c | | Bc-Cc/3c-4c | | | |
| | | Top | Bot | Top | Bot | Top | Bot | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 17th Floor | Slab No | S8 | | S7 | | | | | |
| | Grid | Bc-Cc/2c-3c | | Lc-Mc/2c-3c | | Lc-Mc/2c-3c | | | |
| | | Top | Bot | Top | Bot | Top | Bot | | |
| | | | | | | | | | |
| 17th Floor | Slab No | S5 | | | | | | | |
| | Grid | Ac-Bc/1c-2c | | Ac-Bc/11c-12c | | | | | |
| | | Top | Bot | Top | Bot | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 18th Floor | Slab No | S7 | | S17 | | S5 | | S15 | |
| | Grid | Ac-Bc/2c-3c | | Bc-Cc/3c-4c | | Ac-Bc/1c-2c | | Bc/3c-4c | |
| | | Top | Bot | Top | Bot | Top | Bot | Top | Bot |
| | | | | | | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | |
|---|---|---|---|---|
| 19th Floor | Slab No | S12 | | |
| | Grid | Cc-Ec/10c-11c | | |
| | | Top | Bot | |
| | | | | |

## Tower C - Details of the Slab to be strengthened Due to Distress

| | | | | |
|---|---|---|---|---|
| 21st Floor | Slab No | S5 | | |
| | Grid | Ac-Bc/11c-12c | | |
| | | Top | Bot | |
| | | | | |

## TOWER C-AWHO-without distress

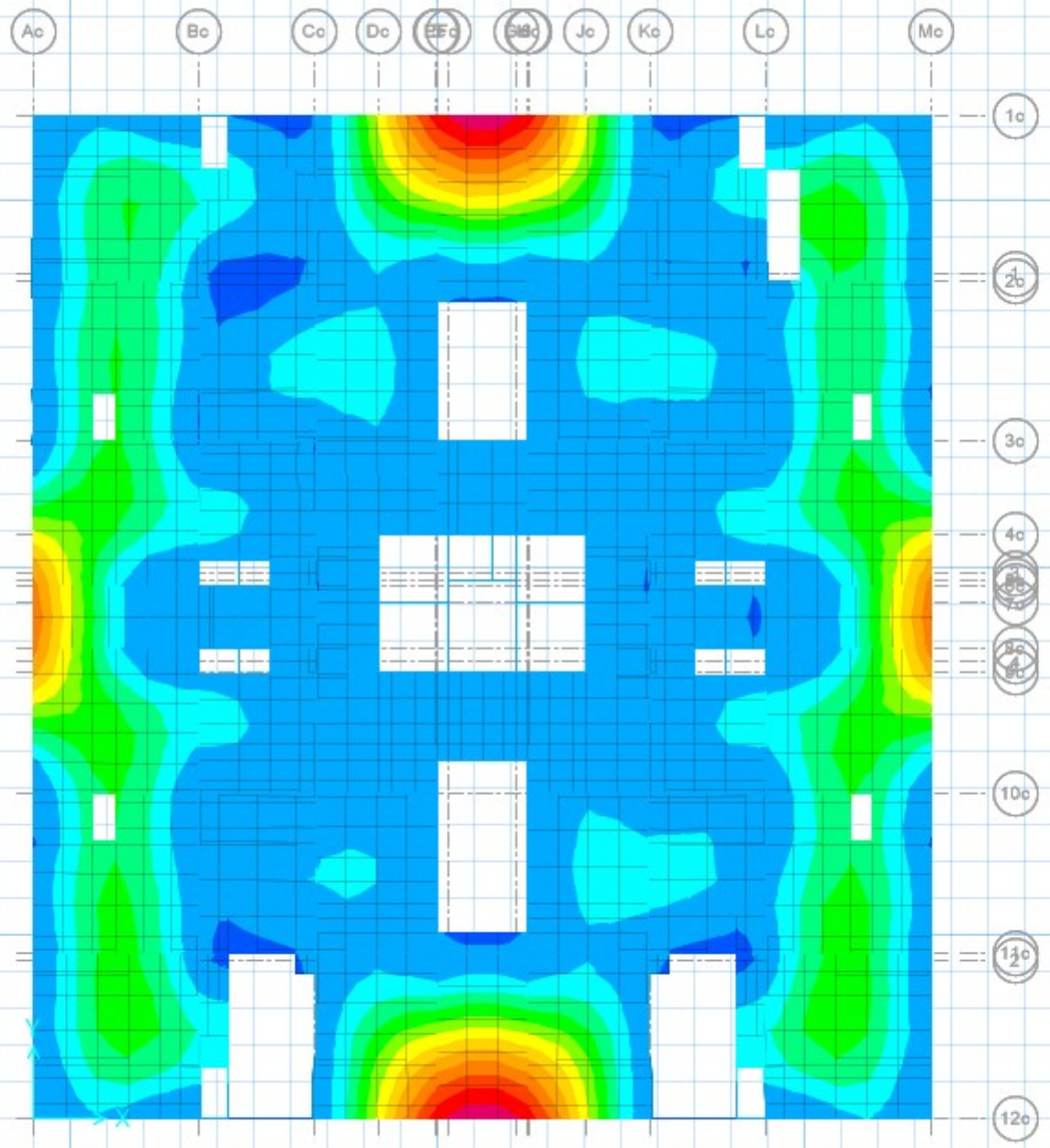
## SLAB REINFORCEMENT DETAILS

**Annexure 18**

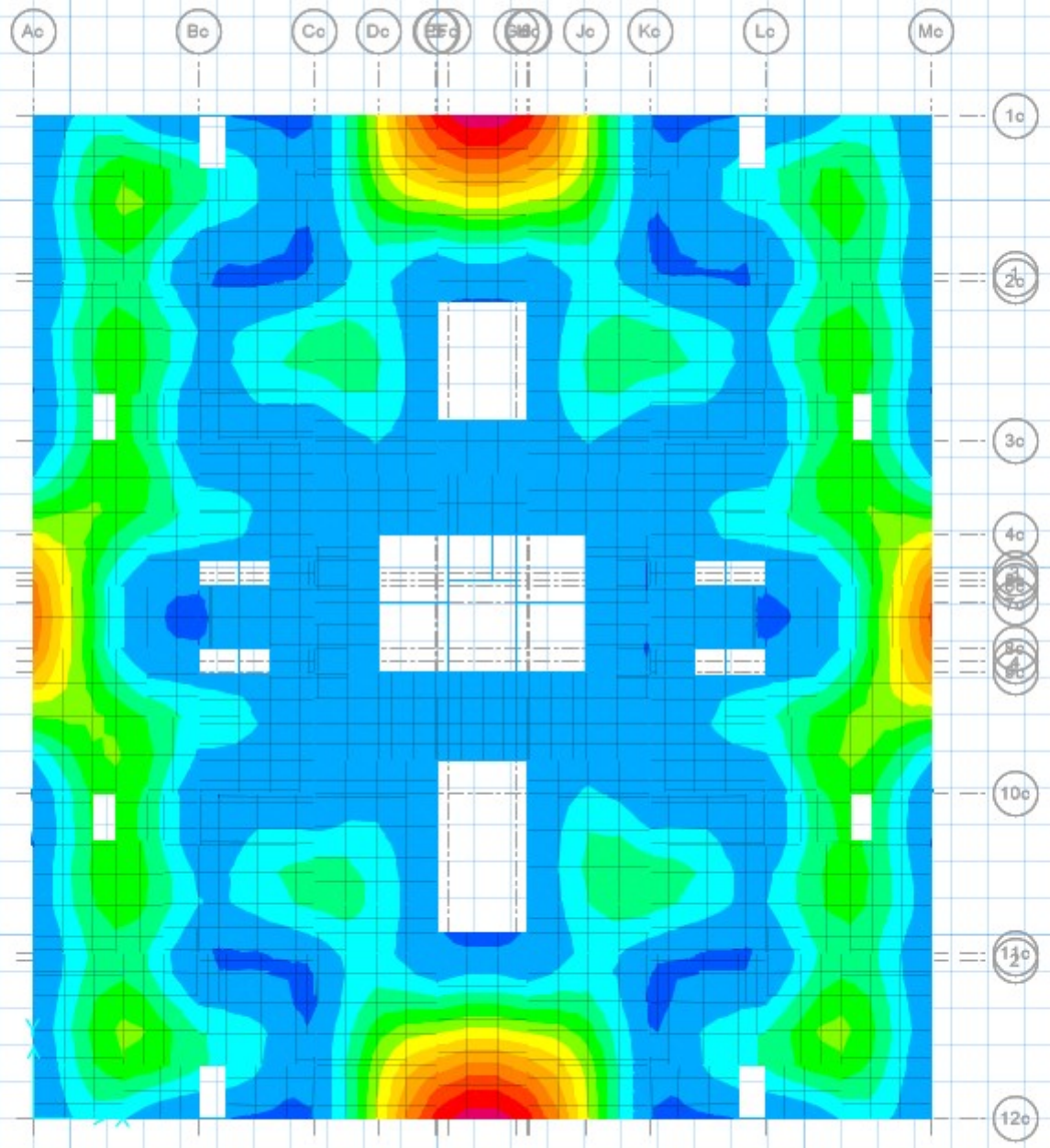
**ST-WD-REB.117C-018b(GF)**

| | Slab No | lx (m) | ly (m) | Type of slab | Support condtion | slab thk provided in (m ) | Astx (+ve) req@ mid span in mm2 | Astx (+ve) Provided@ mid span in mm2 | Status | Asty required (+ve)@ mid span | Asty provided (+ve)@ mid span | Status | Elastic deflection(mm) | Immediate cracked deflection /SD(mm) | Long term deflection (mm) | Limiting deflection(Lx/250) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GF/Basement roof | S1 | 5.03 | 5.045 | Two way | Two adjacent side discontinuous | 0.15 | 209.77 | 785 | Ok | 206.61 | 785 | Ok | 2.38 | 3.5 | 9 | 20.12 |
| | S2 | 0.865 | 3.465 | One way | | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 0.87 | 1.8 | 5 | 3.46 |
| | S3 | 3.73 | 5.03 | Two way | Two adjacent side discontinuous | 0.15 | 180 | 392.5 | Ok | 180 | 392.5 | Ok | 6.3 | 11.8 | 26.5 | 14.92 |
| | S4 | 2.73 | 5.03 | Two way | one short edge discontinuous | 0.15 | 180 | 436.11 | Ok | 180 | 392.5 | Ok | 7.55 | 16.5 | 29.99 | 10.92 |
| | S5 | 3.375 | 5.045 | Two way | one short edge discontinuous | 0.15 | 180 | 523.33 | Ok | 180 | 436.1 | Ok | 1.89 | 3.5 | 8.5 | 13.5 |
| | S5a | 3.375 | 5.045 | Two way | one short edge discontinuous | 0.15 | 180 | 279.25 | Ok | 180 | 251 | Ok | 1.89 | 3.5 | 8.5 | 13.5 |
| | S6 | 3.53 | 4.875 | Two way | one short edge discontinuous | 0.15 | 180 | 523.33 | Ok | 180 | 436.1 | Ok | 0.42 | 0.6 | 2 | 14.12 |
| | S7 | 3.73 | 4.875 | Two way | One long edge discontinuous | 0.15 | 180 | 654.16 | Ok | 180 | 392.5 | Ok | 0.9 | 1.1 | 2.7 | 14.92 |
| | S8 | 4.395 | 5.045 | Two way | one short edge discontinuous | 0.15 | 180 | 436.11 | Ok | 180 | 523.3 | Ok | 3 | 8 | 18.5 | 17.58 |
| | S9 | 3.53 | 4.875 | Two way | Interior panel | 0.15 | 180 | 523.33 | Ok | 180 | 436.1 | Ok | 0.5 | 0.8 | 4 | 14.12 |
| | S10 | 3.53 | 3.61 | Two way | Two adjacent side discontinuous | 0.15 | 180 | 523.33 | Ok | 180 | 436.1 | Ok | 0.5 | 1 | 3.3 | 14.12 |
| | S11 | 1.93 | 3.44 | Two way | one short edge discontinuous | 0.12 | 180 | 392.5 | Ok | 180 | 436.1 | Ok | 3.9 | 8.8 | 22.5 | 7.72 |
| | S11a | 1.93 | 5.34 | One way | | 0.12 | 144 | 436.11 | Ok | 144 | 392.5 | Ok | 1.56 | 10.3 | 22.5 | 7.72 |
| | S12 | 1.5 | 1.75 | Two way | Two short edges discontinuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 1.6 | 3 | 4.5 | 6 |
| | S13 | 1.5 | 2.56 | Two way | one short edge discontinuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 1.6 | 3.5 | 8 | 6 |
| | S14 | 1.946 | 4.2 | One way | | 0.15 | 180 | 785 | Ok | | 785 | Ok | 0.02 | 0.05 | 0.8 | 7.784 |
| | S15 | 3.685 | 10.19 | One way | | 0.15 | 411 | 785 | Ok | | 785 | Ok | 0.46 | 0.8 | 2 | 14.74 |
| | S16 | 1.865 | 3.73 | Two way | one long edge discontinuous | 0.15 | 180 | 785 | Ok | 180 | 785 | Ok | 0.5 | 0.2 | 1 | 7.46 |
| | S17 | 2.835 | 3.73 | Two way | one long edge discontinuous | 0.15 | 180 | 785 | Ok | 180 | 785 | Ok | 0.015 | 0.2 | 1 | 11.34 |
| | S18 | 3.73 | 5.845 | Two way | Two adjacent side discontinuous | 0.15 | 180 | 654.16 | Ok | 180 | 392.5 | Ok | 1 | 1.3 | 4 | 14.92 |
| | S19 | 3.73 | 4.875 | Two way | Two adjacent side discontinuous | 0.15 | 180 | 523.33 | Ok | 180 | 436.11 | Ok | 1 | 1.3 | 4 | 14.92 |
| | S20 | 1.93 | 2.85 | Two way | one short edge discontinuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 0.02 | 0.9 | 0.2 | 7.72 |
| | S21 | 1.93 | 2.33 | Two way | one short edge continuous | 0.12 | 144 | 785 | Ok | 144 | 785 | Ok | 0.12 | 0.1 | 0.3 | 7.72 |
| | S22 | 1.93 | 3.23 | Two way | one short edge continuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 0.1 | 0.1 | 0.2 | 7.72 |
| | S23 | 2.805 | 2.835 | Two way | Two short edges discontinuous | 0.15 | 180 | 785 | Ok | 180 | 785 | Ok | 0.05 | 0.05 | 0.5 | 11.22 |
| | S24 | 3.43 | 3.53 | Two way | Interior panel | 0.15 | 180 | 392.5 | Ok | 180 | 392.5 | Ok | 1 | 2.3 | 4.5 | 13.72 |
| | S24a | 3.43 | 3.53 | Two way | Interior panel | 0.15 | 180 | 278.8 | Ok | 180 | 278.8 | Ok | 1 | 2.3 | 4.5 | 13.72 |
| | S25 | 1.625 | 2.69 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 0.5 | 1 | 1.2 | 6.5 |
| | S25a | 1.625 | 2.69 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 278.8 | Ok | 144 | 251 | Ok | 0.5 | 1 | 1.2 | 6.5 |
| | S26 | 1.1 | 1.625 | Two way | one long edge continuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 1.3 | 1.3 | 5 | 4.4 |
| | S27 | 3.945 | 5.03 | Two way | one short edge continuous | 0.15 | 193.11 | 785 | Ok | 180 | 785 | Ok | 2.2 | 3.5 | 9.2 | 15.78 |
| | S28 | 5.03 | 5.045 | Two way | Two adjacent side discontinuous | 0.225 | 367.97 | 785 | Ok | 352 | 785 | Ok | 2.7 | 5 | 7.9 | 20.12 |
| | S29 | 3.37 | 5.045 | Two way | one short edge discontinuous | 0.225 | 270 | 523.33 | Ok | 270 | 436.11 | Ok | 2.5 | 5 | 7.9 | 13.48 |
| | S30 | 3.73 | 5.03 | Two way | one short edge discontinuous | 0.15 | 313.9 | 392.5 | Ok | 232.51 | 392.5 | Ok | 5.2 | 13.1 | 26.29 | 14.92 |
| | S30a | 3.73 | 5.03 | Two way | one short edge discontinuous | 0.15 | 313.9 | 523.33 | Ok | 232.51 | 436.11 | Ok | 5.2 | 13.1 | 26.29 | 14.92 |
| | S31 | 0.78 | 1.375 | Two way | one long edge continuous | 0.12 | 144 | 392.5 | Ok | 144 | 392.5 | Ok | 0.05 | 0.1 | 0.2 | 3.12 |
| | | | | | | | | | | | | | | | **ST-WD-REB.117C-020a-(1F** | |
| 1F | S1 | 1.6 | 2.73 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2 | 2.2 | 4.5 | 6.4 |
| | S2 | 1.6 | 2.31 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2 | 3.35 | 8.8 | 6.4 |
| | S3 | 1.6 | 2.69 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.5 | 1.5 | 4 | 6.4 |
| | S4 | 3.73 | 5.03 | Two way | one short edge discontinuous | 0.12 | 144 | 313.7 | Ok | 144 | 251 | Ok | 6.5 | 14.88 | 25.76 | 14.92 |
| | S5 | 3.43 | 5.03 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2.5 | 4 | 10.7 | 13.72 |
| | S6 | 3.43 | 3.53 | Two way | Interior panel | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.8 | 2.2 | 5 | 13.72 |
| | S7 | 3.37 | 3.98 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2.15 | 4.35 | 5.5 | 13.48 |
| | S8 | 4.59 | 4.875 | Two way | Interior panel | 0.12 | 144 | 313.75 | Ok | 144 | 251 | Ok | 1 | 2.22 | 5.5 | 18.36 |
| | S9 | 1.5 | 3.73 | One way | | 0.12 | 144 | 251 | Ok | | 251 | Ok | 1 | 1.8 | 5.5 | 6 |
| | S10 | 1.5 | 1.75 | Two way | Two short edges discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.8 | 3.7 | 8 | 6 |
| | S11 | 1.5 | 2.56 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2 | 4.6 | 9 | 6 |
| | S12 | 3.73 | 4.345 | Two way | one long edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.8 | 2 | 6 | 14.92 |
| | S13 | 2.71 | 10.19 | One way | | 0.15 | 220 | 785 | Ok | | 392.5 | Ok | 0.3 | 0.5 | 1.6 | 10.84 |
| | S14 | 3.44 | 4.39 | Two way | one long edge discontinuous | 0.12 | 144 | 313.75 | Ok | 144 | 251 | Ok | 3.5 | 10 | 19.3 | 13.76 |
| | S15 | 1.6 | 2.32 | Two way | Interior panel | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2.5 | 3.6 | 8.5 | 6.4 |
| | S16 | 1.6 | 2.06 | Two way | Interior panel | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.7 | 3 | 7.3 | 6.4 |
| | S17 | 3.53 | 3.68 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.5 | 1.22 | 4 | 14.12 |
| | S18 | 1.93 | 5.04 | One way | | 0.15 | 180 | 251 | Ok | | 251 | Ok | 3.8 | 11.5 | 22.27 | 7.72 |
| | S19 | 1.93 | 3.53 | Two way | Two long edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.1 | 0.09 | 0.3 | 7.72 |
| | S20 | 1.946 | 4.2 | One way | | 0.15 | 180 | 785 | Ok | | 392.5 | Ok | 0.03 | 0.05 | 0.5 | 7.784 |
| | S21 | 1.865 | 3.73 | Two way | one long edge discontinuous | 0.15 | 180 | 785 | Ok | 180 | 392.5 | Ok | 0.2 | 0.05 | 0.7 | 7.46 |
| | S22 | 1.865 | 2.73 | Two way | one long edge discontinuous | 0.15 | 180 | 785 | Ok | 180 | 392.5 | Ok | 0.03 | 0.02 | 0.3 | 7.46 |
| | S23 | 1.58 | 2.73 | Two way | one long edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.05 | 0.05 | 0.5 | 6.32 |
| | S24 | 2.73 | 5.03 | Two way | Two short edge discontinuous | 0.15 | 144 | 313.75 | Ok | 144 | 251 | Ok | 7.3 | 16.8 | 29.22 | 10.92 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | **ST-WD-REB.117C-022a(2F & 3F)/ 022e(4th to 10th) / 022j(11th to 22nd)** | | | |
| 2F-Typical till 22F | S1 | 1.6 | 2.73 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.75 | 3 | 7.5 | 6.4 |
| | S2 | 1.6 | 2.31 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.77 | 2.8 | 7.7 | 6.4 |
| | S3 | 1.6 | 2.69 | Two way | Two adjacent side discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1 | 1.6 | 4.3 | 6.4 |
| | S5 | 3.43 | 5.03 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2.3 | 3.8 | 9.95 | 13.72 |
| | S6 | 3.43 | 3.53 | Two way | Interior panel | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.2 | 2 | 5 | 13.72 |
| | S7 | 3.37 | 3.98 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 2 | 3.87 | 8.7 | 13.48 |
| | S8 | 4.59 | 4.875 | Two way | Interior panel | 0.12 | 144 | 313.75 | Ok | 144 | 251 | Ok | 1 | 1.5 | 5 | 18.36 |
| | S9 | 1.5 | 3.73 | One way | | 0.12 | 144 | 251 | Ok | | 251 | Ok | 0.7 | 1 | 3.47 | 6 |
| | S10 | 1.5 | 1.75 | Two way | Two short edges discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.9 | 3 | 7 | 6 |
| | S11 | 1.5 | 2.56 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.7 | 3.8 | 8.25 | 6 |
| | S12 | 3.73 | 4.345 | Two way | one long edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.85 | 1.5 | 4.6 | 14.92 |
| | S13 | 2.71 | 10.19 | One way | | 0.15 | 220 | 785 | Ok | | 392.5 | Ok | 0.35 | 0.4 | 1.8 | 10.84 |
| | S15 | 1.6 | 2.32 | Two way | Interior panel | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.4 | 3.39 | 8 | 6.4 |
| | S16 | 1.6 | 2.06 | Two way | Interior panel | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 1.4 | 3 | 7.3 | 6.4 |
| | S17 | 3.53 | 3.68 | Two way | one short edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.6 | 1.5 | 4 | 14.12 |
| | S19 | 1.93 | 3.53 | Two way | Two long edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.1 | 0.1 | 0.3 | 7.72 |
| | S20 | 1.946 | 4.2 | One way | | 0.15 | 180 | 785 | Ok | | 392.5 | Ok | 0.04 | 0.05 | 0.3 | 7.784 |
| | S21 | 1.865 | 3.73 | Two way | one long edge discontinuous | 0.15 | 180 | 785 | Ok | 180 | 392.5 | Ok | 0.2 | 0.15 | 0.8 | 7.46 |
| | S22 | 1.865 | 2.73 | Two way | one long edge discontinuous | 0.15 | 180 | 785 | Ok | 180 | 392.5 | Ok | 0.05 | 0.05 | 0.3 | 7.46 |
| | S23 | 1.58 | 2.73 | Two way | one long edge discontinuous | 0.12 | 144 | 251 | Ok | 144 | 251 | Ok | 0.07 | 0.067 | 0.4 | 6.32 |
| | S24 | 0.78 | 1.375 | Two way | one short edge discontinuous | 0.12 | 144 | 278.8 | Ok | 144 | 278.8 | Ok | 0.15 | 0.1 | 0.3 | 3.12 |

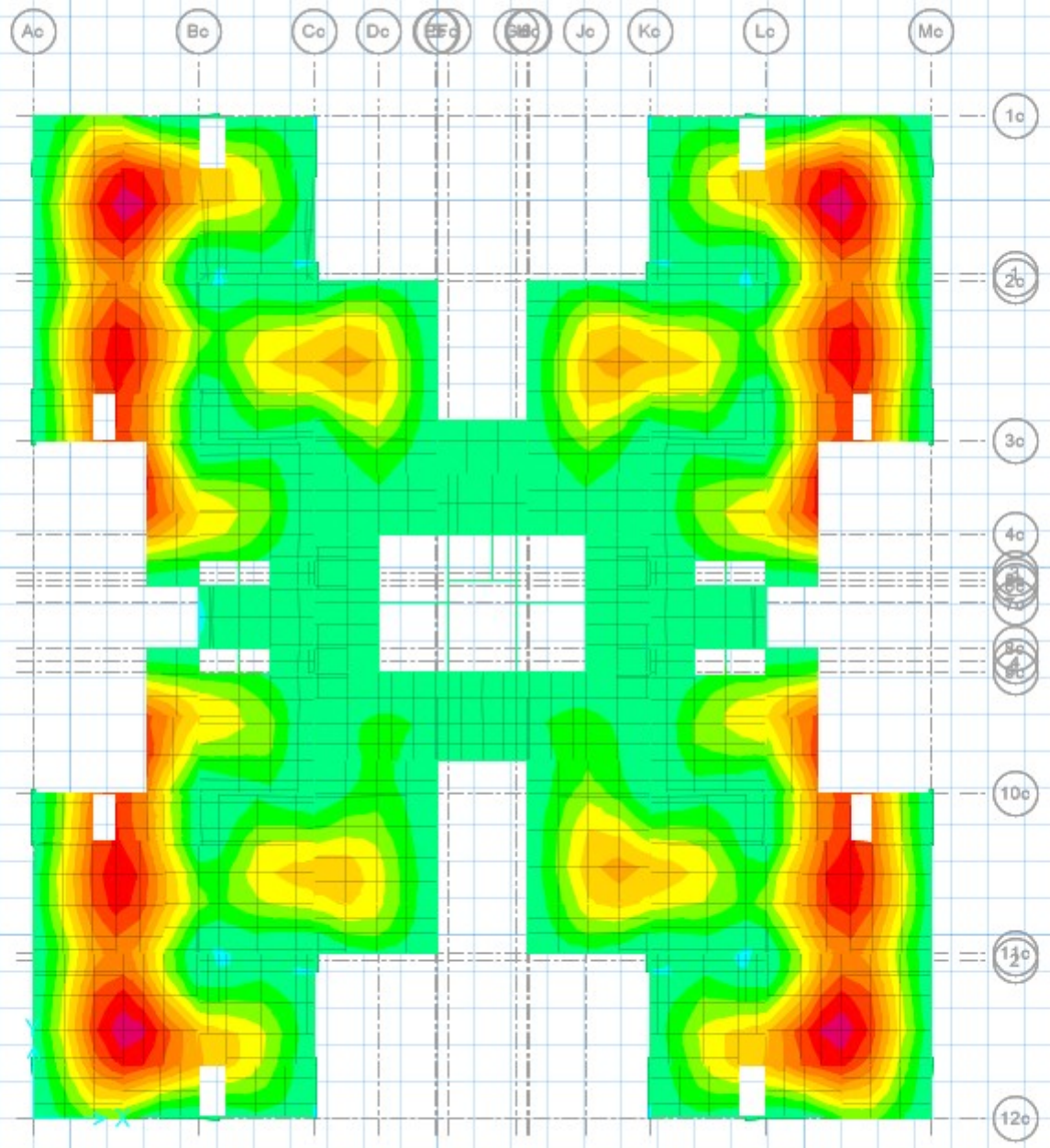
Shape - Displacements (LONG TERM DEFLECTION) [mm]



Shape - Displacements (LONG TERM DEFLECTION) [mm]



Shape - Displacements (long term defln) [mm]



**AWHO**

**Tower- C** | **Annexure-22**

**Pile Foundation Evaluation** | **Sheet 1 of 2**

**Pile Details-Gravity Load Combination - Without Distress of Elements - 100% Health of building**

| S No | Pile Type | Pile Details | | | Reinforcement Details | | | | Rings | LA (m) | Pile Capacity | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pile Dia | Unit | Length | Length (m) | Reinforce-ment | Top Length m | Reinforce-ment | | | Axial (kN) | Lateral (kN) | Pullot (kN) | |
| 1 | P1 | 800 | mm | 45 to 55 | 45 | 6T25 | 16 | 12 T25 | T8-250c/c | 0.609 | 1800 | | | |
| 2 | P2 | 1000 | mm | 45 to 55 | 45 | 8T25 | 20 | 16 T25 | T8-250c/c | 0.809 | 2800 | | | |
| 3 | P3 | 1100 | mm | 45 to 55 | 45 | 9T25 | 22 | 18T25 | T8-250c/c | 0.909 | 3500 | | | |
| 4 | P4 | 600 | mm | 45 to 55 | 45 | 6T25 | 12 | | T8-250c/c | 0.509 | 1200 | | | |
| 5 | P5 | 700 | mm | | | | | | | | 1500 | | | |

| S No | Pile Cap | Column Group | Columns Etabs | Pile Name | Load Combination | Column Load (kN) | Mx | My | V1 | V2 | P | Piles Required | Pile Provided | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PC66 | C4 | P30 | P1 | 101] [DL + LL] | 2027.90 | 0.6628 | -2.72 | | | | | | |
| | PC66 | C1 | P36 | P1 | 101] [DL + LL] | 2054.96 | 0.6845 | -1.22 | | | | | | |
| | | | | | | 4082.86 | 1.3473 | 3.94 | 2.21 | 6.5 | 4091.54 | 2.27 | 6 | |
| 2 | PC78 | C1 | P6 | P1 | 101] [DL + LL] | 2096.24 | 0.9458 | -1.11 | 1.17 | -1.82 | | | | |
| | PC78 | C4 | P10 | P1 | 101] [DL + LL] | 2054.78 | -0.6696 | -2.19 | -1.10 | -3.60 | | | | |
| | | | | | | 4151.02 | 0.2762 | -3.30 | 2.27 | 5.42 | 4158.71 | 2.31 | 6 | |
| 3 | PC63 | C4 | P29 | P1 | 101] [DL + LL] | 2095.72 | 0.6887 | 4.64 | 1.13 | 7.61 | | | | |
| | PC63 | C1 | P31 | P1 | 101] [DL + LL] | 2148.20 | -0.9579 | 2.59 | 1.18 | 3.20 | | | | |
| | | | | | | 4243.92 | -0.2692 | 7.23 | 2.31 | 10.81 | 4251.15 | 2.36 | 6 | |
| 4 | PC75 | C1 | P1 | P1 | 101] [DL + LL] | 2108.86 | 0.9521 | 1.13 | 3.50 | | | | | |
| | PC75 | C4 | P7 | P1 | 101] [DL + LL] | 2068.81 | -0.6737 | 2.24 | 5.81 | | | | | |
| | | | | | | 4177.67 | 0.9521 | 3.37 | 9.31 | | | | 6 | |
| 5 | PC71 | C7 | P28 | P3 | 101] [DL + LL] | 2331.16 | 0.9851 | 2.34 | 1.08 | 2.57 | 2334.49 | 0.67 | 2 | |
| 6 | PC74 | C7 | P14 | P3 | 101] [DL + LL] | 2404.74 | 1.0175 | 2.22 | | | 2407.98 | 2.01 | 2 | |
| 7 | PC67 | C7 | P23 | P3 | 101] [DL + LL] | 2361.53 | 0.9901 | 3.15 | | | 2365.67 | 1.58 | 2 | |
| 8 | PC72 | C7 | P11 | P3 | 101] [DL + LL] | 2431.69 | 1.0251 | 2.28 | | | 2434.99 | 1.35 | 2 | |
| 9 | PC65 | C6 | C8 | P2 | 101] [DL + LL] | 6001.07 | 12.2322 | 2.25 | | | | | | |
| | PC65 | C5 | C7 | P2 | 101] [DL + LL] | 6931.79 | 9.9306 | 4.34 | | | | | | |
| | PC65 | C3 | P34 | P2 | 101] [DL + LL] | 1982.31 | 0.924 | 2.68 | | | | | | |
| | PC65 | C2 | P35 | P2 | 101] [DL + LL] | 2592.47 | 2.7195 | 0.98 | | | | | | |
| | | | | | | 17507.65 | 25.8063 | 10.24 | 31.90 | 12.66 | 17552.20 | 6.27 | 9 | |
| 10 | PC77 | C6 | C4 | P2 | 101] [DL + LL] | 5731.29 | 5.3517 | 0.13 | | | | | | |
| | PC77 | C5 | C3 | P2 | 101] [DL + LL] | 6982.86 | 11.1775 | 3.42 | | | | | | |
| | PC77 | C3 | P4 | P2 | 101] [DL + LL] | 1971.51 | 0.8932 | 3.71 | | | | | | |
| | PC77 | C2 | P5 | P2 | 101] [DL + LL] | 2196.92 | 1.4415 | 0.72 | | | | | | |
| | | | | | | 16882.59 | 18.86 | 7.27 | 23.32 | 8.99 | 16914.89 | 6.04 | 9 | |
| 11 | PC70 | C11 | C12 | P3 | 101] [DL + LL] | 5680.12 | 0.1538 | 1.95 | | | | | | |
| | PC70 | C11 | C11 | P3 | 101] [DL + LL] | 5598.76 | 1.4354 | 0.42 | | | | | | |
| | PC70 | C8 | P13 | P3 | 101] [DL + LL] | 2774.05 | 1.1389 | 1.02 | | | | | | |
| | PC70 | C9 | P16 | P3 | 101] [DL + LL] | 2354.85 | 0.8982 | 0.20 | | | | | | |
| | PC70 | C10 | P18 | P3 | 101] [DL + LL] | 2545.80 | 1.9219 | 0.98 | | | | | | |
| | PC70 | C10 | P20 | P3 | 101] [DL + LL] | 2527.34 | 1.9169 | 0.97 | | | | | | |
| | PC70 | C9 | P22 | P3 | 101] [DL + LL] | 2235.89 | 0.8675 | 0.45 | | | | | | |
| | PC70 | C8 | P27 | P3 | 101] [DL + LL] | 2665.99 | 0.9461 | 1.17 | | | | | | |
| | | | | | | 26382.79 | 9.2787 | 7.15 | 10.21 | 7.86 | 26400.86 | 7.54 | 18 | |
| 12 | PC73 | CW1 | P8 | P3 | 101] [DL + LL] | 3164.51 | -1.0688 | -0.82 | | | | | | |
| | PC73 | CW1 | P9 | P3 | 101] [DL + LL] | 2613.31 | -1.0452 | 0.86 | | | | | | |
| | PC73 | CW1 | P25 | P3 | 101] [DL + LL] | 2896.00 | 0.9278 | -0.51 | | | | | | |
| | PC73 | CW1 | P26 | P3 | 101] [DL + LL] | 2886.46 | 0.9228 | -0.49 | | | | | | |
| | PC73 | CW1 | P8 | P3 | 101] [DL + LL] | 3164.51 | -1.0688 | -0.82 | | | | | | |
| | PC73 | CW1 | P9 | P3 | 101] [DL + LL] | 2613.31 | -1.0452 | 0.86 | | | | | | |
| | | | | | | | | | | | | | 8 | |
| 13 | PC64 | C5 | C5 | P2 | 101] [DL + LL] | 7008.05 | 11.04 | -7.37 | | | | | | |
| | PC64 | C6 | C6 | P2 | 101] [DL + LL] | 5863.77 | 10.93 | 4.19 | | | | | | |
| | PC64 | C2 | P32 | P2 | 101] [DL + LL] | 2233.95 | 3.20 | -0.75 | | | | | | |
| | PC64 | C3 | P33 | P2 | 101] [DL + LL] | 1985.87 | -0.92 | 2.62 | | | | | | |
| | | | | | | | | | | | | | 9 | |
| 14 | PC76 | C5 | C1 | P2 | 101] [DL + LL] | 7009.85 | -10.63 | 3.05 | | | | | | |
| | PC76 | C6 | C2 | P2 | 101] [DL + LL] | 5795.92 | -5.40 | 0.32 | | | | | | |
| | PC76 | C2 | P2 | P2 | 101] [DL + LL] | 2205.05 | -1.50 | -0.72 | | | | | | |
| | PC76 | C3 | P3 | P2 | 101] [DL + LL] | 1979.62 | 0.90 | 3.72 | | | | | | |
| | | | | | | | | | | | | | 9 | |
| 15 | PC68 | C11 | C10 | P3 | 101] [DL + LL] | 5867.74 | 0.91 | -1.96 | | | | | | |
| | PC68 | C11 | C9 | P3 | 101] [DL + LL] | 5718.84 | 1.81 | 0.02 | | | | | | |
| | PC68 | C8 | P12 | P3 | 101] [DL + LL] | 2817.36 | -1.16 | -1.13 | | | | | | |
| | PC68 | C9 | P15 | P3 | 101] [DL + LL] | 2415.04 | -0.93 | -0.20 | | | | | | |
| | PC68 | C10 | P17 | P3 | 101] [DL + LL] | 2575.95 | 1.91 | -0.99 | | | | | | |
| | PC68 | C10 | P19 | P3 | 101] [DL + LL] | 2565.82 | -1.79 | -0.98 | | | | | | |
| | PC68 | C9 | P21 | P3 | 101] [DL + LL] | 2269.06 | 0.88 | -0.22 | | | | | | |
| | PC68 | C8 | P24 | P3 | 101] [DL + LL] | 2768.68 | 1.13 | -1.98 | | | | | | |
| | | | | | | | | | | | | | 18 | |
| 16 | PC69 | CW2 | P37 | P3 | 101] [DL + LL] | 2189.16 | -4.01 | 3.35 | | | | | 12 | |

| AWHO | |
|---|---|
| Tower- C | Annexure-22 |
| Pile Foundation Evaluation | Sheet 2 of 2 |

**Demand / Capacity of Total Piles**

Weight of the Building-( DL + LL) = 161788 kN

Weight of the Building-(DL+LL+EQ) = 278574 kN

| Pile Name | Dia | | Capacity of 1 Pile | Nos. | Total Capacity |
|---|---|---|---|---|---|
| P1 | 800 | mm | 1800 | 24 | 43200 kN |
| P2 | 1000 | mm | 2800 | 48 | 134400 kN |
| P3 | 1100 | mm | 3500 | 60 | 210000 kN |
| P4 | 600 | mm | 1200 | - | |

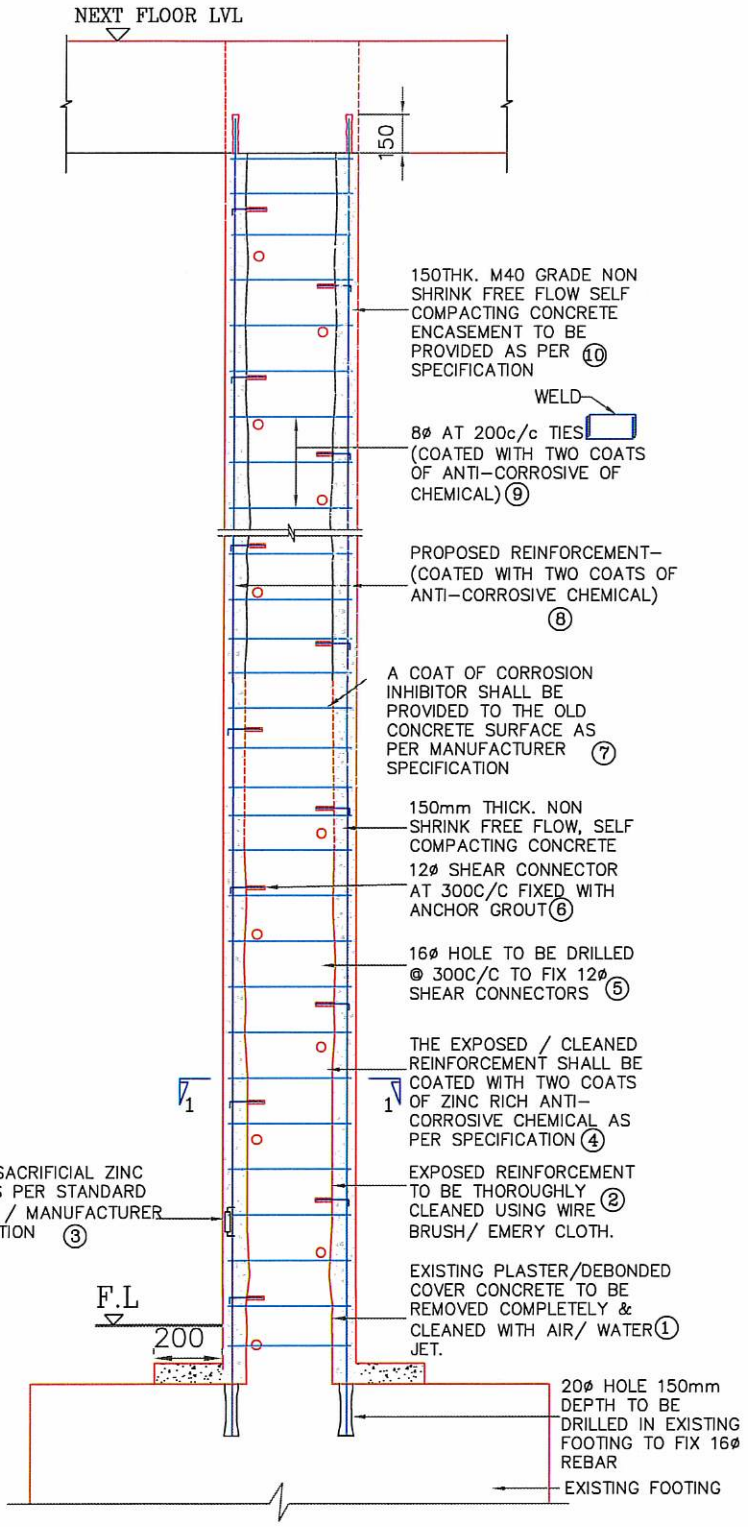
**Capacity of All Piles** = **387600** kN

**Demand / Capacity-DL + LL** = **0.42** **Okay**

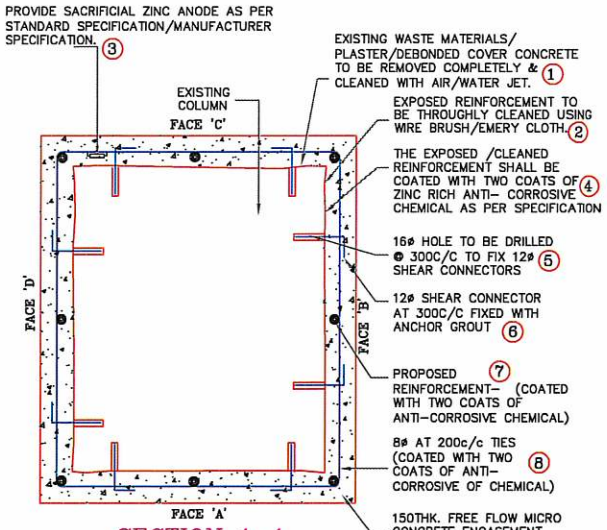
**Demand / Capacity-DL + LL + EQ** = **0.72** **Okay**

| Pile Cap Details | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pile Caps | | L | B | D | Bot.Reinf. | | Top Reinf. | Remarks |
| PC71 | PCA | 4.15 | 1.4 | 1.6 | 16T25 | 6T16 | | Adequate |
| PC66 | PCB | 6.1 | 3.1 | 1.6 | T25 @ 160 | T0 @160 | T25 @ 160 | Adequate |
| PC65 | PCC | 6.3 | 6.3 | 1.6 | T20 @ 100 | T20 @ 120 | T20 @ 130 | Adequate |
| PC73 | PCD | 6.9 | 4.83 | 1.2 | T20 @120 | T20 @ 120 | T20 @ 120 | Adequate |
| PC70 | PCE | 15.15 | 6.9 | 1.6 | T25 @140 | T25 @ 140 | T20 @ 140 | Adequate |
| PC69 | PCF | 7.6 | 5.5 | 1.2 | T16 @ 150 | T16 @ 150 | T16 @ 150 | Adequate |
| - | PCQ | 16.37 | 9.7 | 1.6 | T25 @ 140 | T25 @ 140 | T25 @ 160 | Adequate |

# RESTORATION SKETCHES

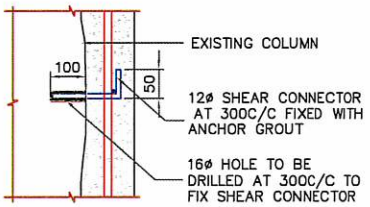



DETAILS OF COLUMN ENCASEMENT IN SECTIONAL ELEVATION (TYPICAL)

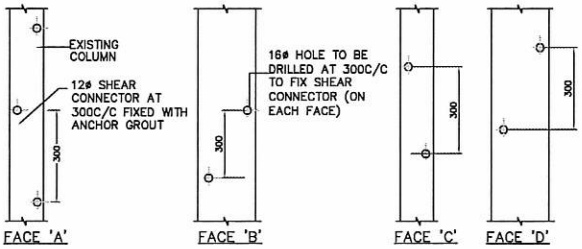



SECTION 1-1

(TYPICAL PLAN OF COLUMN SHOWING ENCASEMENT DETAILS)




TYPICAL DETAILS OF SHEAR CONNECTOR




ELEVATION INDICATING SHEAR CONNECTORS IN COLUMNS

TITLE

# TYPICAL COLUMN ENCASEMENT

| DATE | REV | DESCRIPION |
|---|---|---|
| | | |
| | | |

CLIENT M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

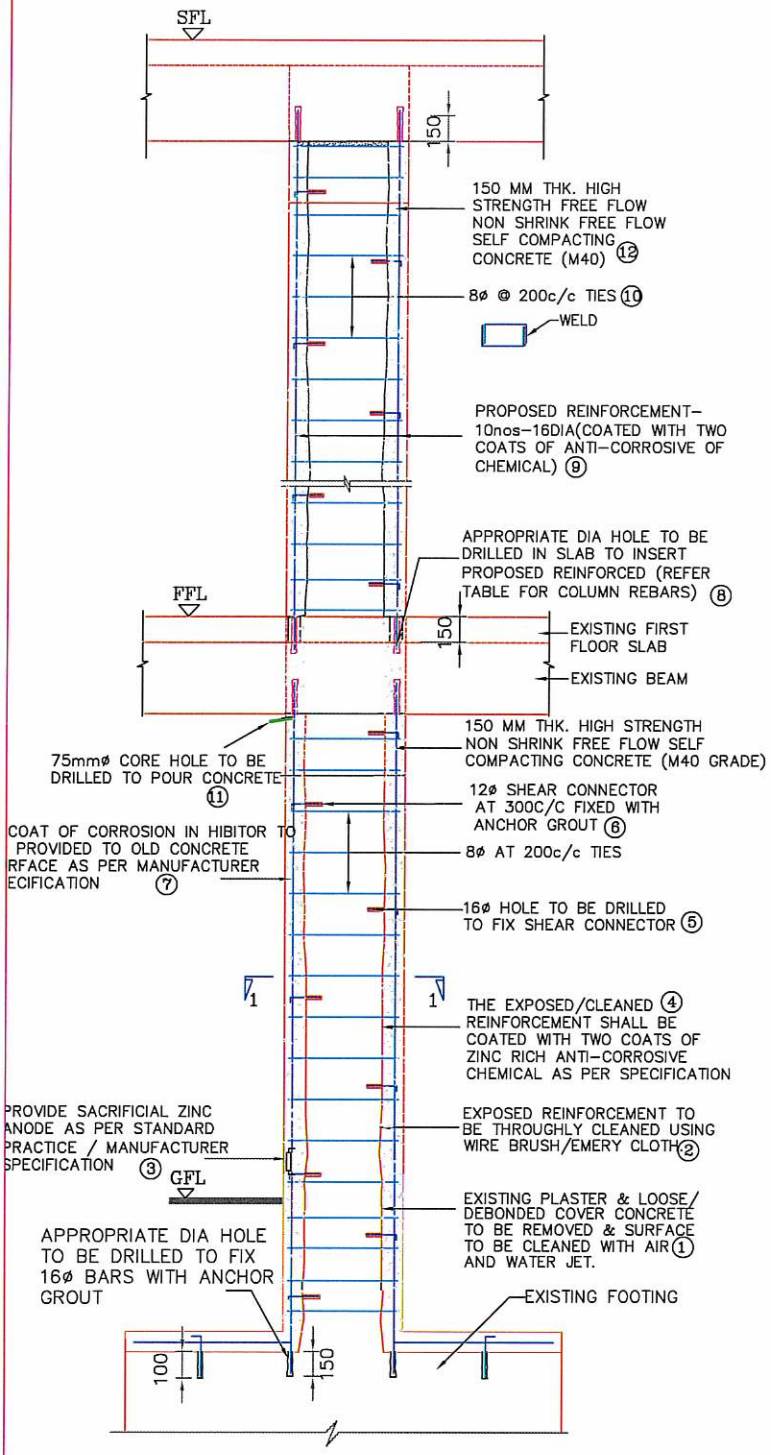
PROJECT STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

| DRAWN: | RSKK | CHECKED: | CHR/MBS | SCALE | NTS | DATE | 24-04-2023 |
|---|---|---|---|---|---|---|---|
| DESIGNED: | | APPROVED: | AJ | DWG. REF. No. | RM/01 | REV.No. | R0 |

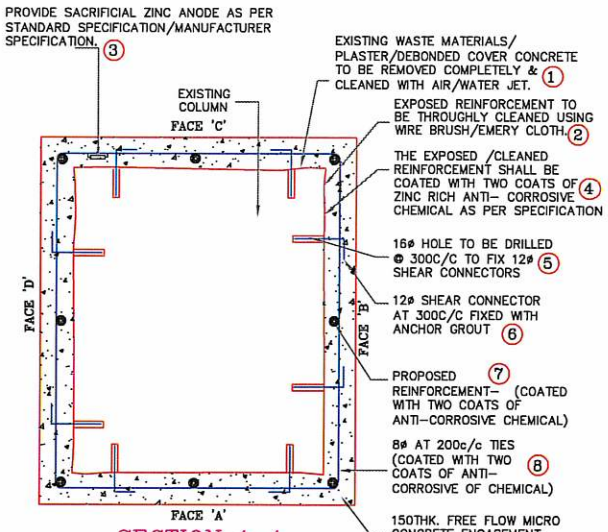
CONSULTANTS

BUREAU VERITAS (INDIA) PVT. LTD.
# 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070.
Tel. : 080-26980200

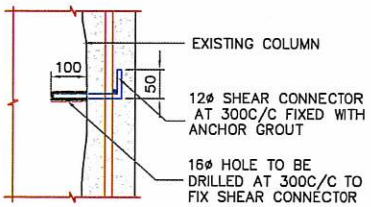
CONTRACT NO 17671143



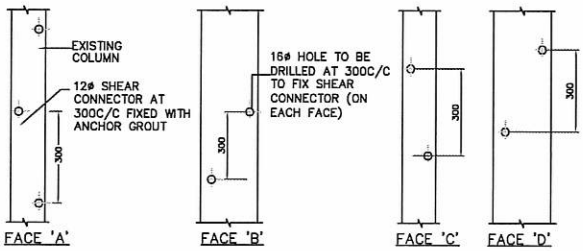

DETAILS OF COLUMN ENCASEMENT IN SECTIONAL ELEVATION (TYPICAL)




SECTION 1–1
(TYPICAL PLAN OF COLUMN SHOWING ENCASEMENT DETAILS)




TYPICAL DETAILS OF SHEAR CONNECTOR




ELEVATION INDICATING SHEAR CONNECTORS IN COLUMNS

TITLE: **TYPICAL SKETCH FOR COLUMN ENCASEMENT IN CONSECUTIVE FLOORS**

CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

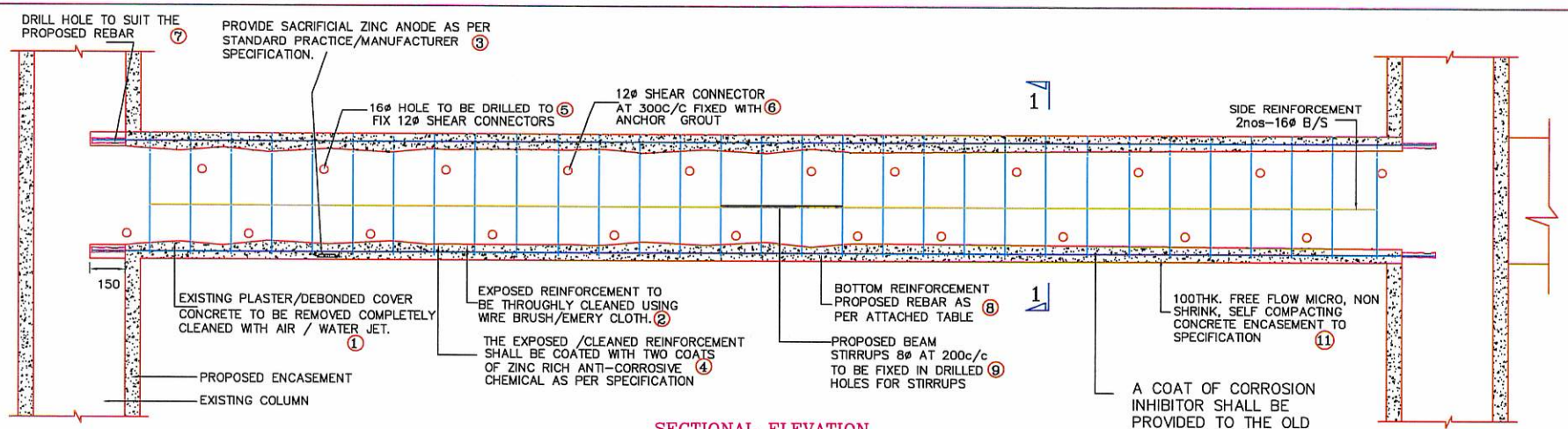
PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

| DATE | REV | DESCRIPION |
|---|---|---|
| | | |
| | | |

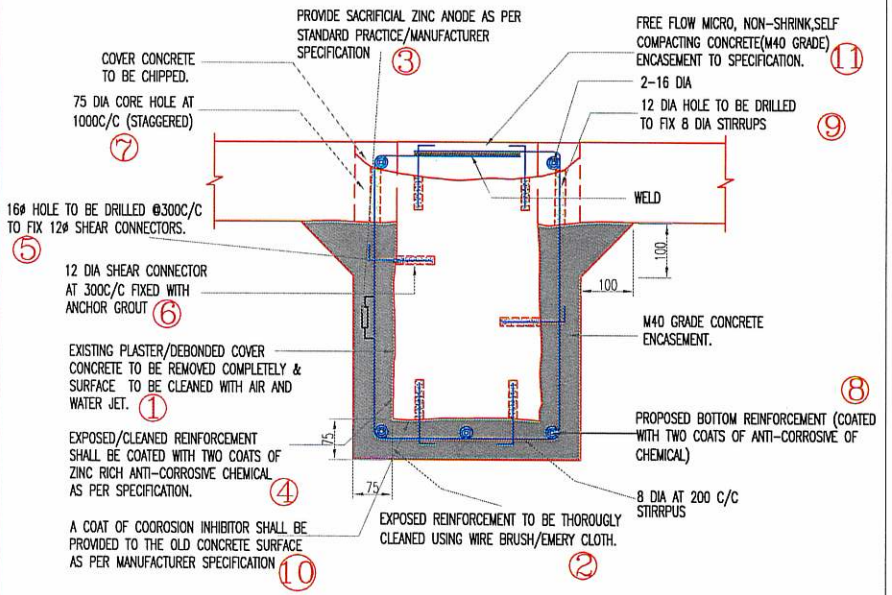
| | | | | | |
|---|---|---|---|---|---|
| DRAWN: | RSKK | CHECKED: | CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| DESIGNED: | | APPROVED: | AJ | DWG. REF. No.: RM/02 | REV.No.: R0 |

CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.
# 1030, 13th Cross, Banashankari 2nd Stage, Bangalore – 560 070.
Tel. : 080–26980200

CONTRACT NO: 17671143

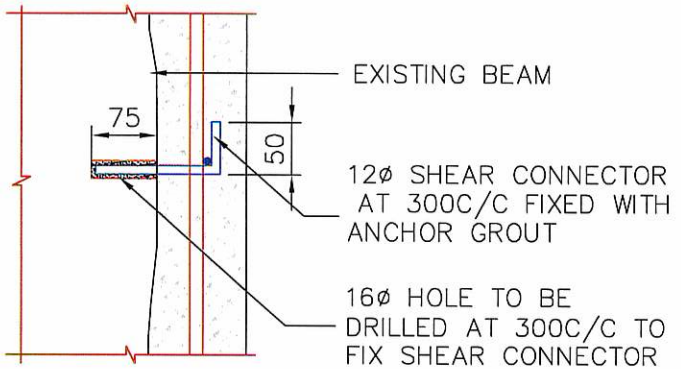



SECTIONAL ELEVATION




SECTION 1-1

(TYPICAL PLAN OF BEAM SHOWING ENCASEMENT DETAILS)




TYPICAL DETAILS OF SHEAR CONNECTOR

CLIENT

M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT

STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE

**BEAM STRENGTHENING DETAILS**

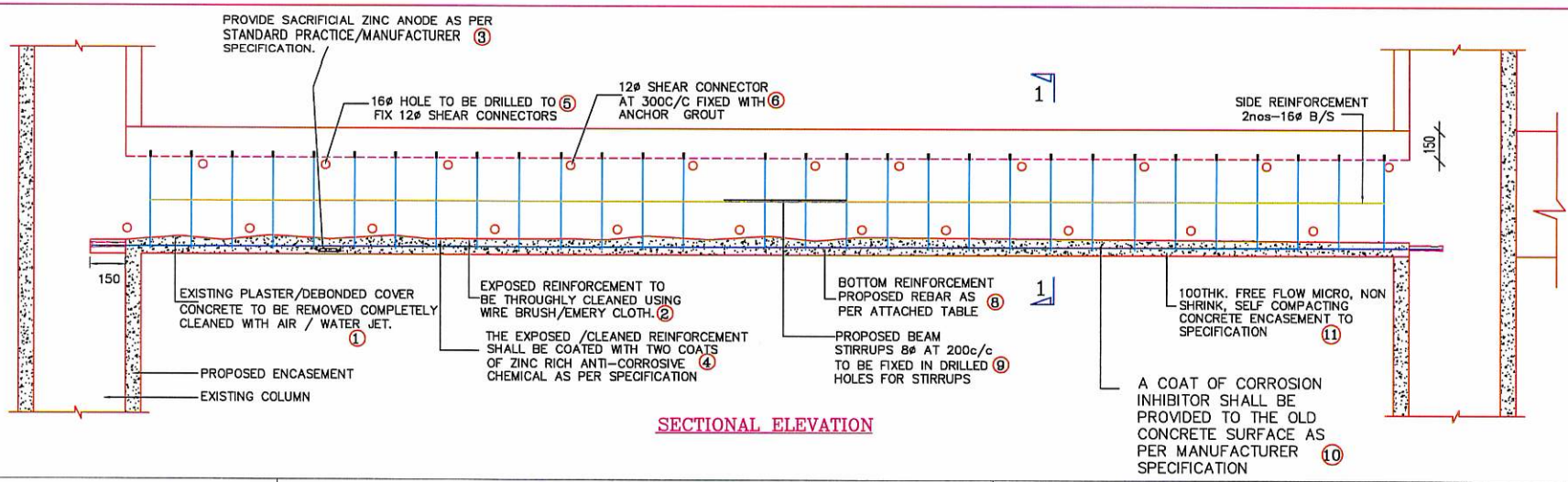
| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE NTS | DATE 24-04-2023 |
| | APPROVED: AJ | DWG. REF. No : RM/03A | REV.No. R0 |

CONSULTANTS

BUREAU VERITAS (INDIA) PVT. LTD.
# 1030, 13th Cross, Banashankari 2nd Stage, Bengaluru - 560 070.
Tel. : 080-26980200

CONTRACT NO

17671143

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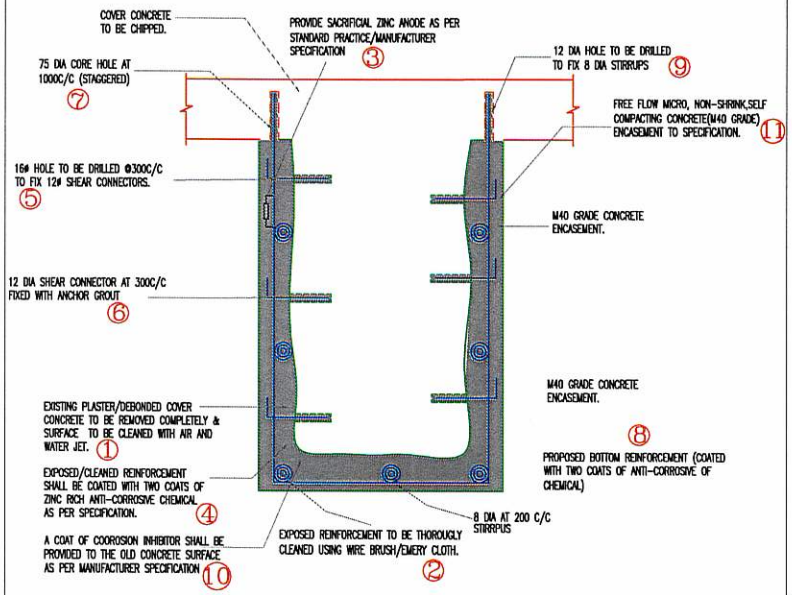
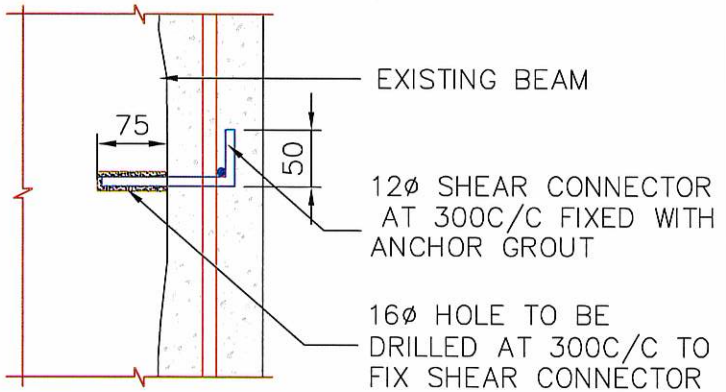
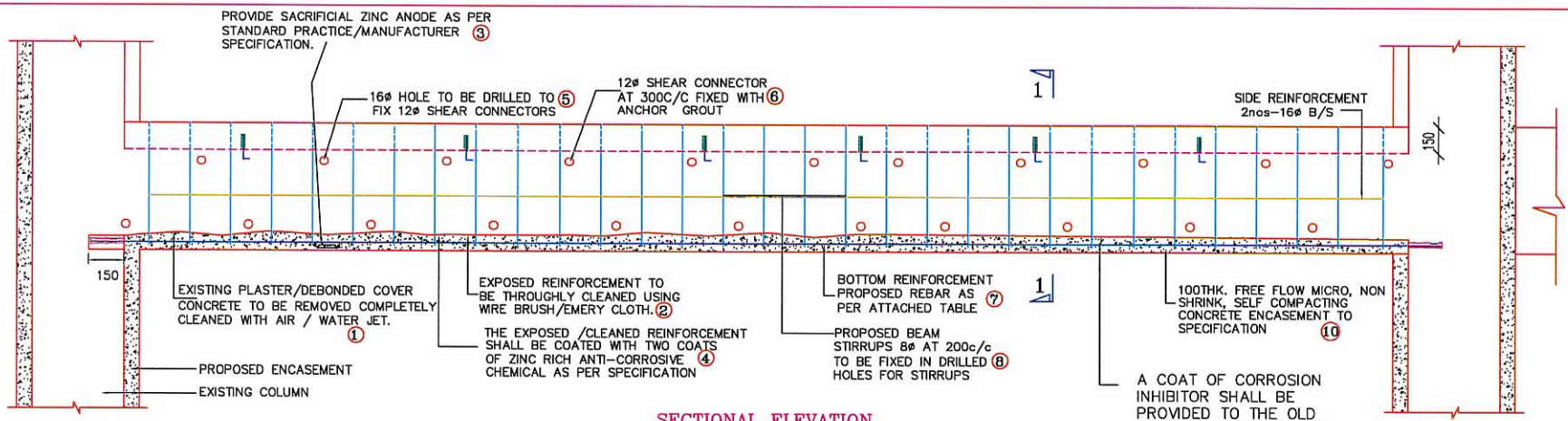



SECTION 1-1

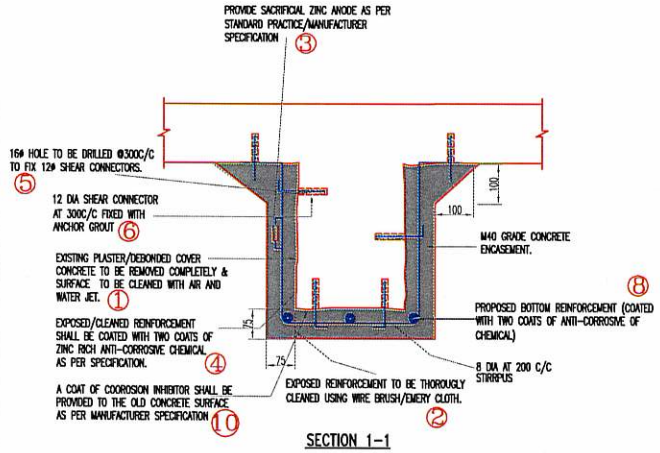



TYPICAL DETAILS OF SHEAR CONNECTOR

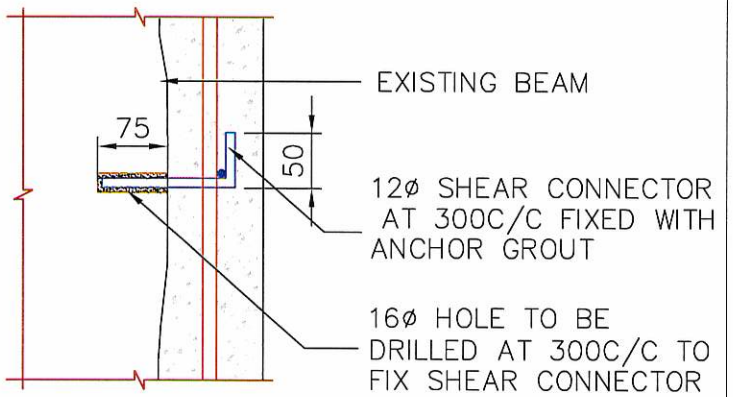
| | | | | | |
|---|---|---|---|---|---|
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | TITLE: **BEAM STRENGTHENING DETAILS** | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | | | APPROVED: AJ | DWG. REF. No : RM/03B | REV.No. R0 |
| | | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bengaluru - 560 070. Tel. : 080-26980200 | | CONTRACT NO: 17671143 | |




SECTIONAL ELEVATION




SECTION 1–1




# TYPICAL DETAILS OF SHEAR CONNECTOR

CLIENT
M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

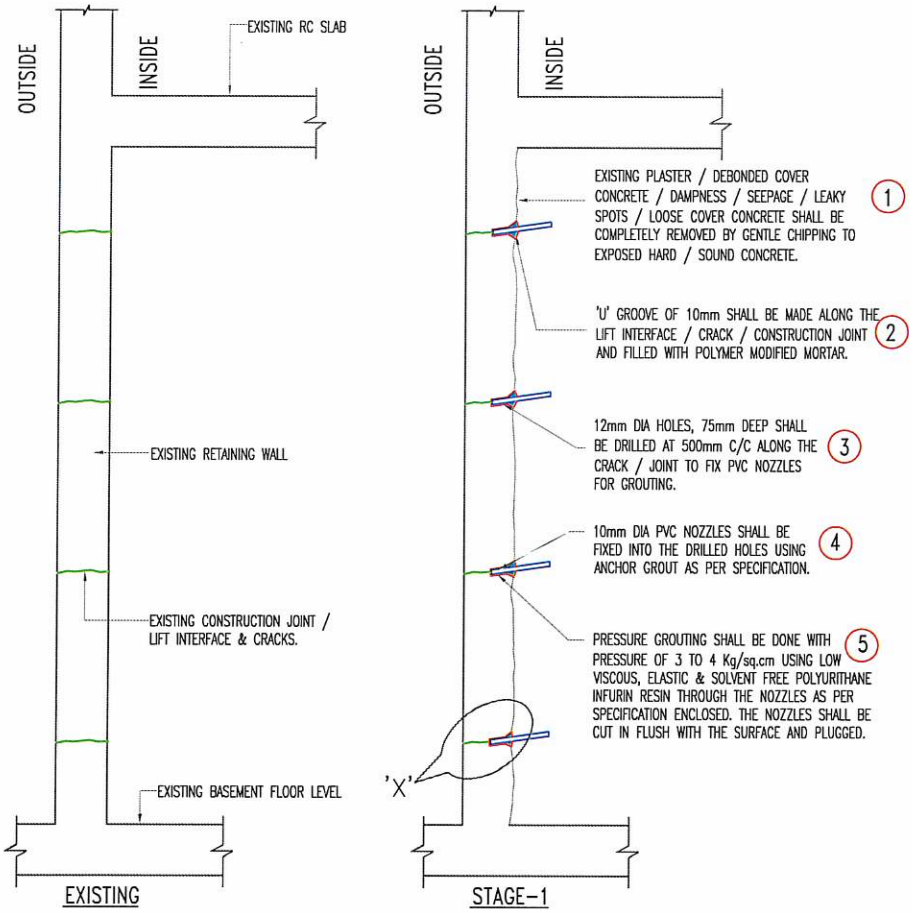
PROJECT
STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

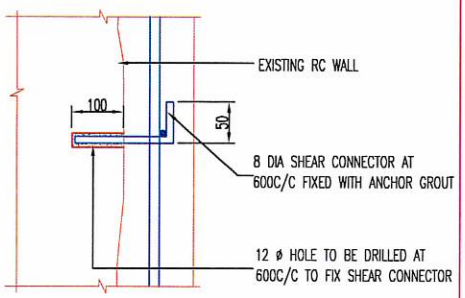
TITLE
**BEAM STRENGTHENING DETAILS**

| | | | | | |
|---|---|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE NTS | DATE 24-04-2023 | | |
| | APPROVED: AJ | DWG. REF. No : RM/03C | REV.No. R0 | | |

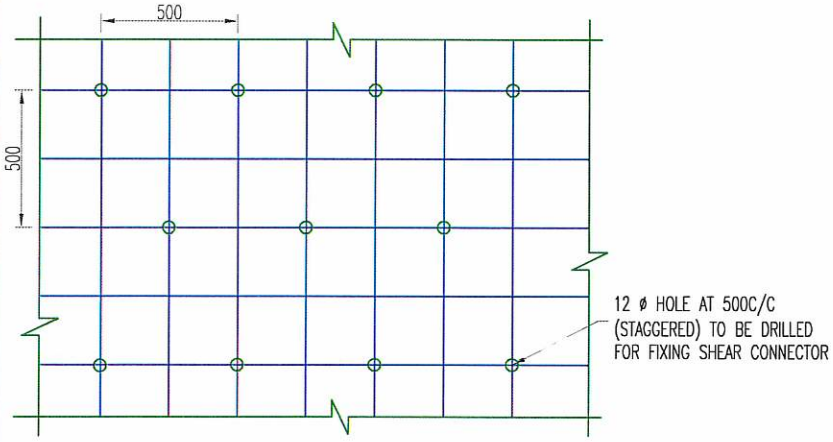
CONSULTANTS
BUREAU VERITAS (INDIA) PVT. LTD.
# 1030, 13th Cross, Banashankari 2nd Stage, Bengaluru – 560 070.
Tel. : 080–26980200

CONTRACT NO
17671143

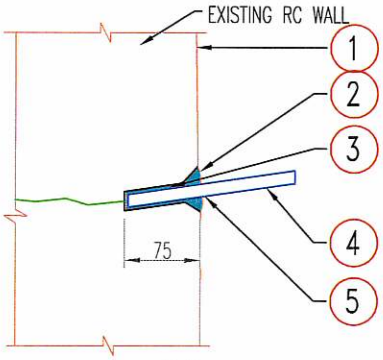



TYPICAL DETAILS OF SHEAR CONNECTOR

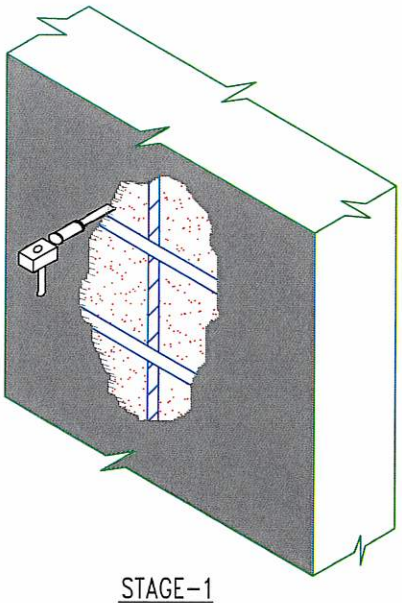



PLAN-SHEAR CONNECTOR & CAPLETS

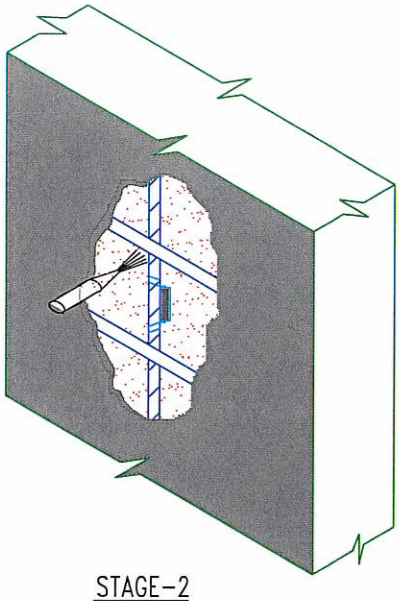



DETAILS AT 'X'

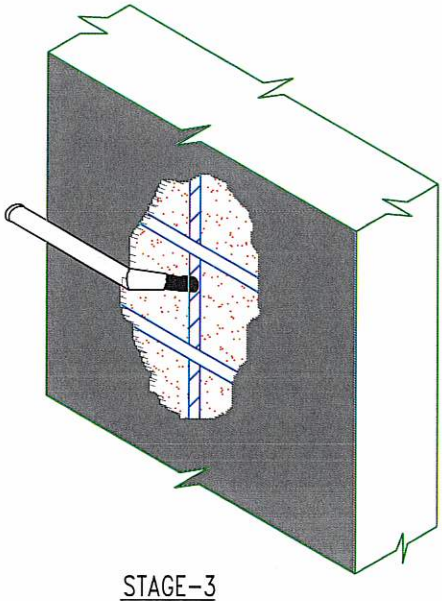
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TITLE | **FOR CRACK TREATMENT IN RETAINING WALL WITH SEEPAGE/LEAKAGE/DAMPNESS** | | | | | | |
| | | DATE | REV | DESCRIPION | | | |
| CLIENT | M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | | |
| | | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/04 | REV.No.: R0 | | |
| PROJECT | STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26580200 | | CONTRACT NO: 17671143 | | | |



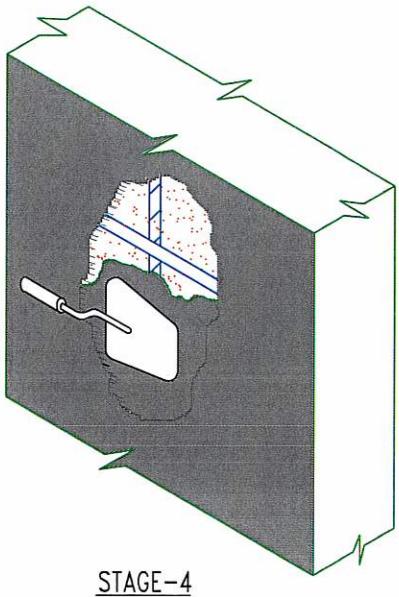
STAGE-1



STAGE-2



STAGE-3



STAGE-4

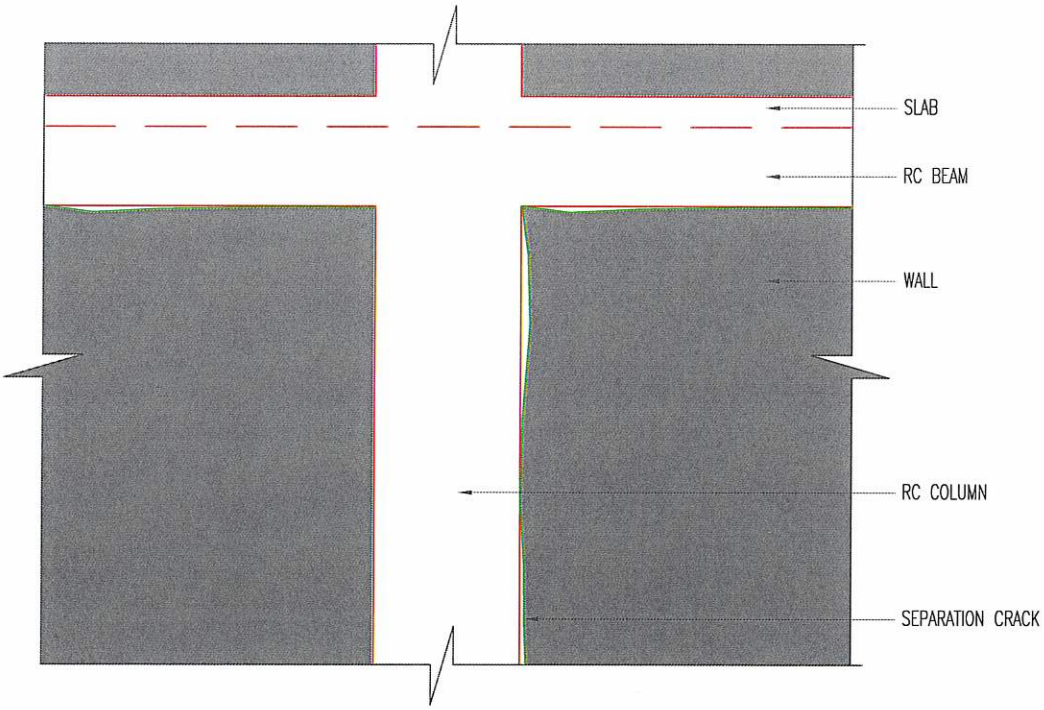
## SEQUENCE OF OPERATIONS:

1. EXISTING LOOSE PLASTER/CONCRETE TO BE REMOVED THOROUGHLY BY CHIPPING, TO EXPOSE HARD CONCRETE.
2. EXPOSED REINFORCEMENT TO BE THOROUGHLY CLEANED USING WIRE BRUSH/EMERYCLOTH/BUFFING WHEEL/WATER JET.
3. SACRIFICIAL ZONC ANODE SHALL BE PROVIDED AS PER STANDARD PRACTICE/MANUFACTURER'S SPECIFICATION
4. TWO COATS OF ANTI-CORROSIVE CHEMICAL AND A COAT OF CORROSION INHIBITOR TO BE PROVIDED ON THE EXPOSED REINFORCEMENT AND CLEANED CONCRETE SURFACE RESPECTIVELY.
5. THE CONCRETE SURFACE TO BE FINISHED WITH POLYMER MODIFIED MORTAR IN FLUSH WITH ADJACENT SURFACE.

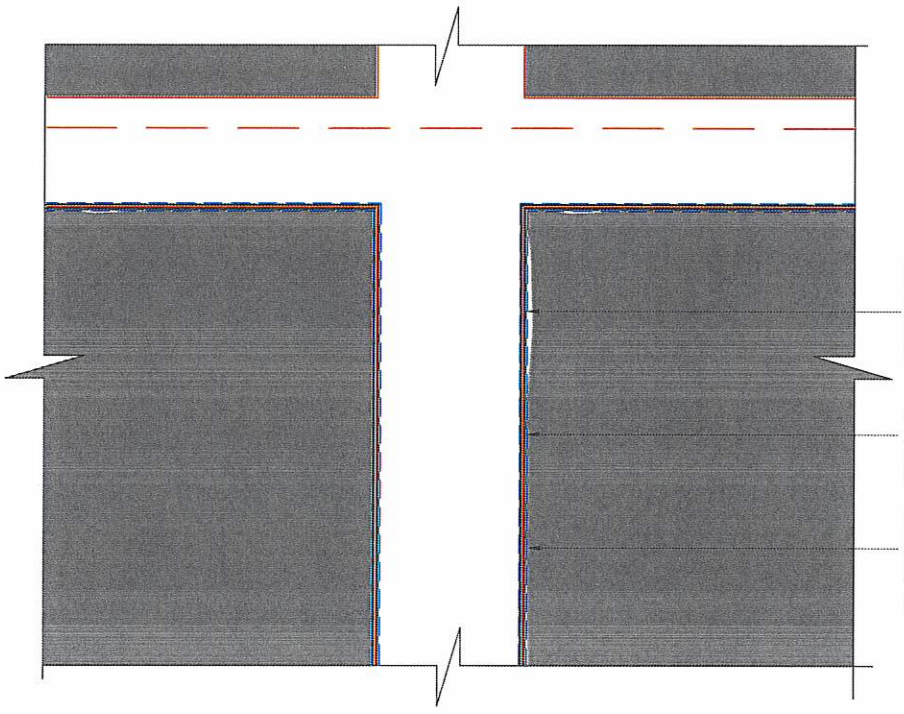
## NOTE:

IF THE THICKNESS OF POLYMER MODIFIED MORTAR LAYER EXCEEDS 20mm, A LAYER OF WELD MESH 50X50X3mmSHALL BE PLACED AND FIXED TO CONCRETE USING CONCRETE NAILS

| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TREATMENT FOR LOCALLY MODIFIED DISTRESSED** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | DESIGNED: | | APPROVED: AJ | DWG. REF. No.: RM/05 | REV.No.: R0 |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26980200 | | | CONTRACT NO: 17671143 | |

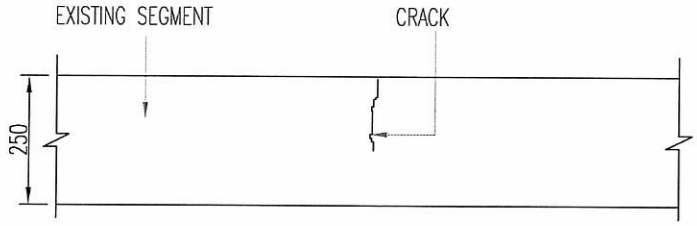



EXISTING




STAGE-1

| | | | | | |
|---|---|---|---|---|---|
| TITLE | **TREATMENT FOR SEPARATION CRACK** | | | | |
| | | DATE | REV | DESCRIPION | |
| CLIENT | M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)<br>VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/06 | REV.No.: R0 |
| PROJECT | STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD.<br># 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070.<br>Tel. : 080-26980200 | | CONTRACT NO: 17671143 | |

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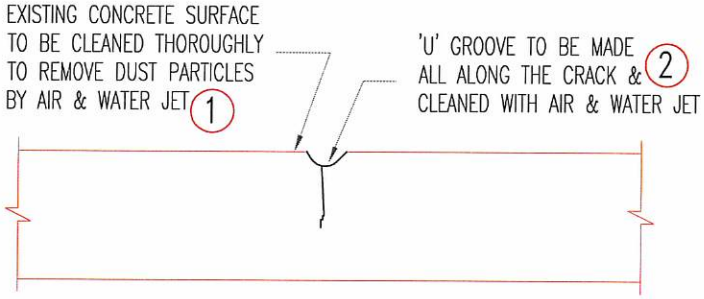
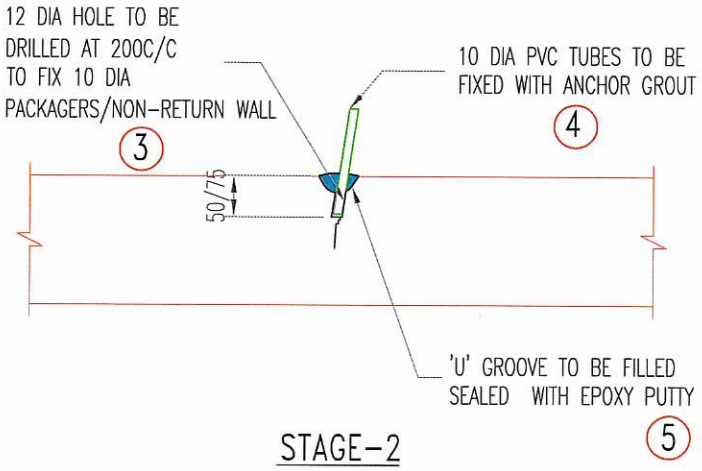
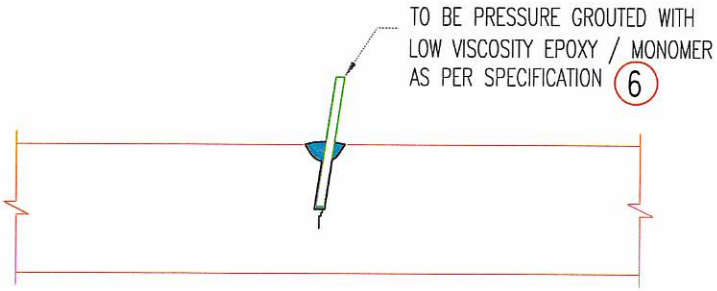


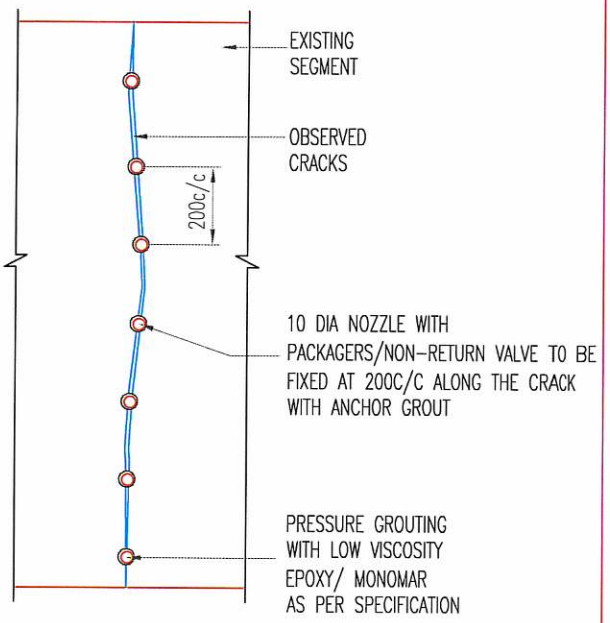

STAGE–1




STAGE–2

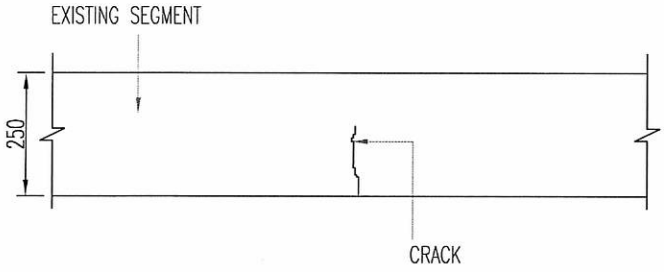



STAGE–3




TOP PLAN

| | | | | | |
|---|---|---|---|---|---|
| TITLE | **TREATMENT FOR CRACK IN SLAB IN TOP** | | | | |
| | | DATE | REV | DESCRIPION | |
| CLIENT | M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/07 | REV.No.: R0 |
| PROJECT | STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore – 560 070. Tel. : 080–26980200 | | CONTRACT NO: 17671143 | |

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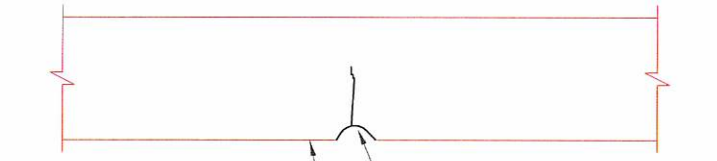
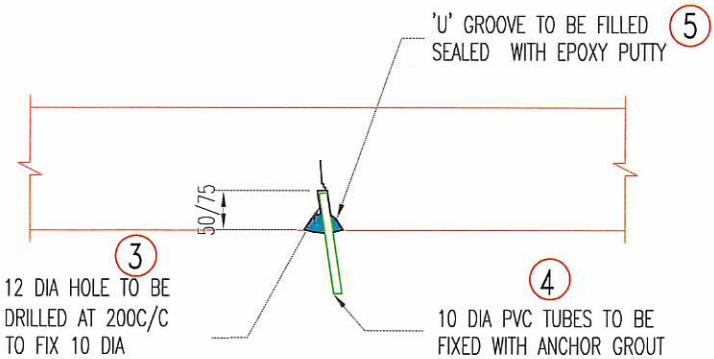


1 EXISTING CONCRETE SURFACE TO BE CLEANED THOROUGHLY TO REMOVE DUST PARTICLES BY AIR & WATER JET

2 'U' GROOVE TO BE MADE ALL ALONG THE CRACK & CLEANED WITH AIR & WATER JET

STAGE-1

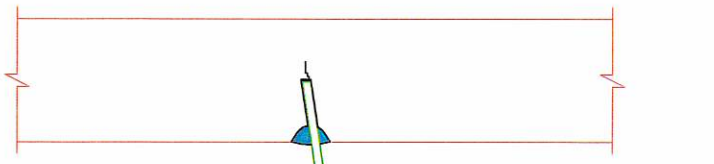



5 'U' GROOVE TO BE FILLED SEALED WITH EPOXY PUTTY

3 12 DIA HOLE TO BE DRILLED AT 200C/C TO FIX 10 DIA PACKAGERS/NON-RETURN WALL

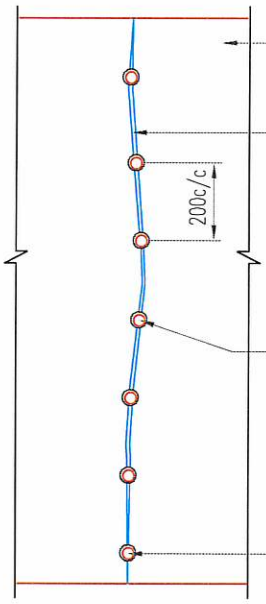
4 10 DIA PVC TUBES TO BE FIXED WITH ANCHOR GROUT

STAGE-2



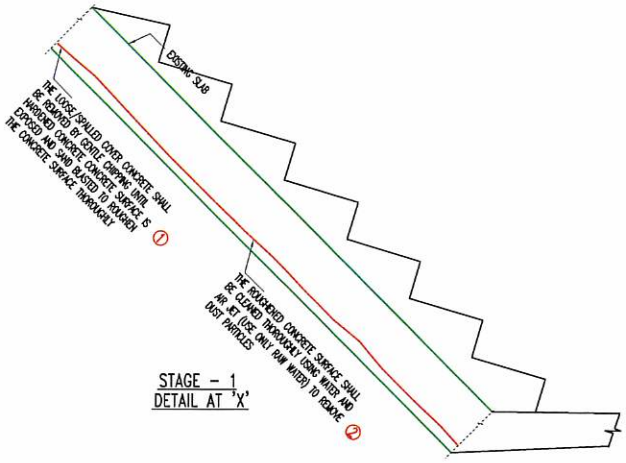
6 TO BE PRESSURE GROUTED WITH LOW VISCOSITY EPOXY / MONOMER AS PER SPECIFICATION

STAGE-3

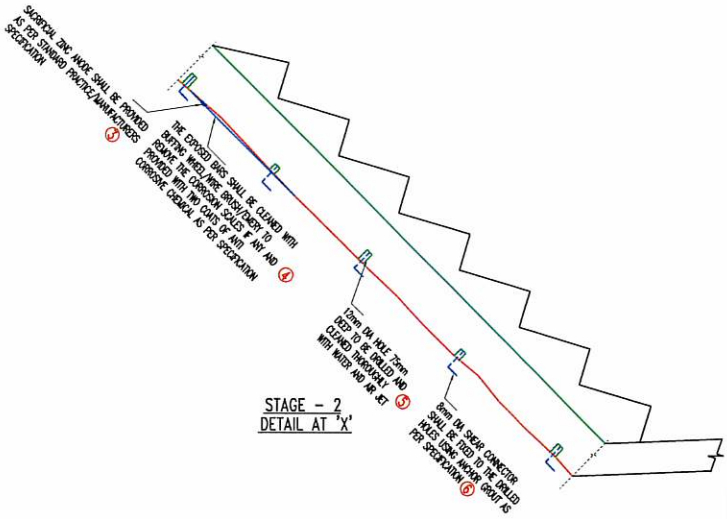



TOP PLAN

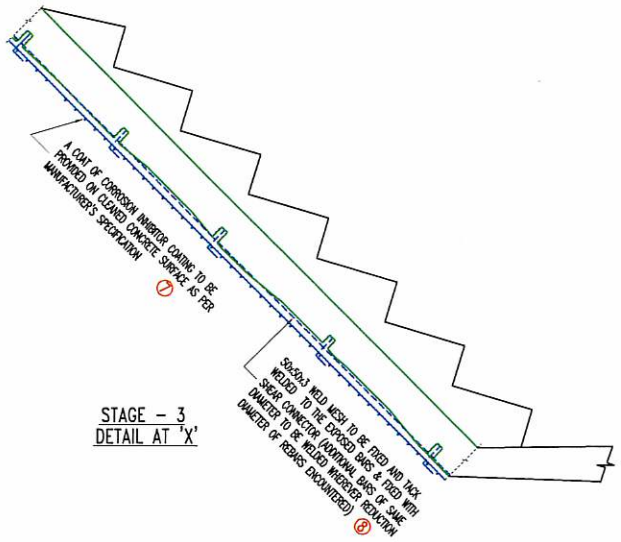
| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TREATMENT FOR CRACK IN SLAB IN BOTTOM** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/08 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26980200 | | CONTRACT NO: 17671143 | | |



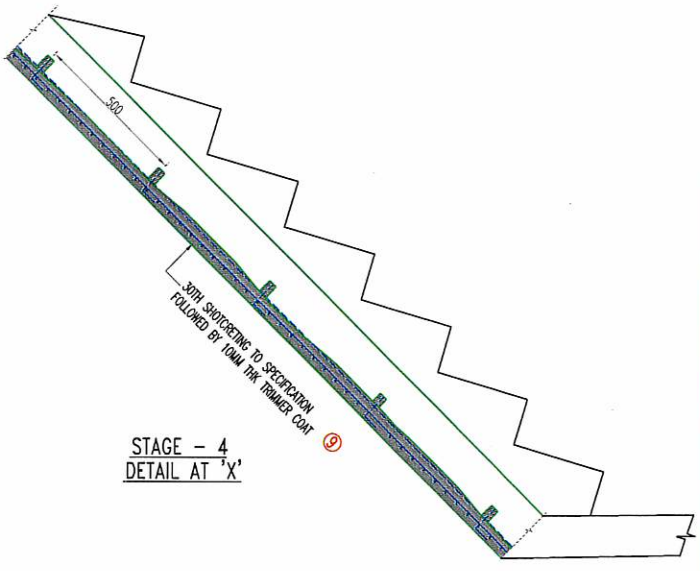

STAGE – 1
DETAIL AT 'X'




STAGE – 2
DETAIL AT 'X'

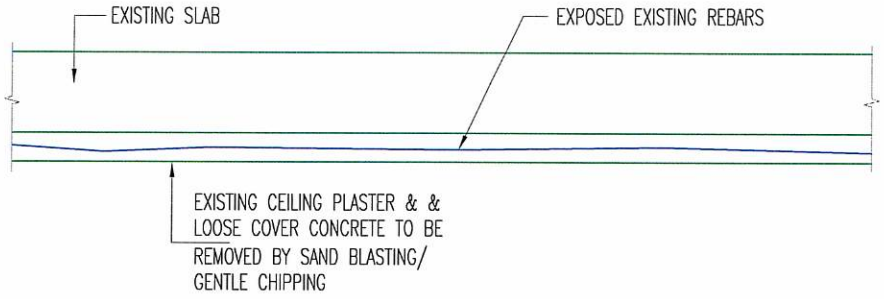



STAGE – 3
DETAIL AT 'X'

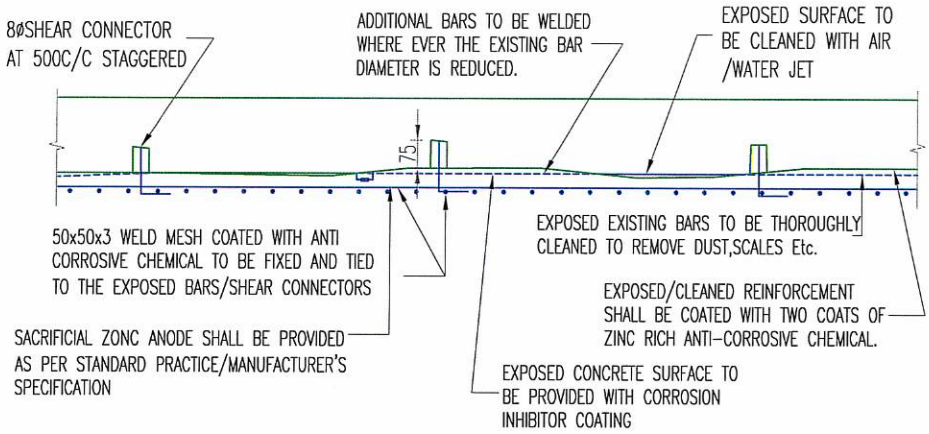



STAGE – 4
DETAIL AT 'X'

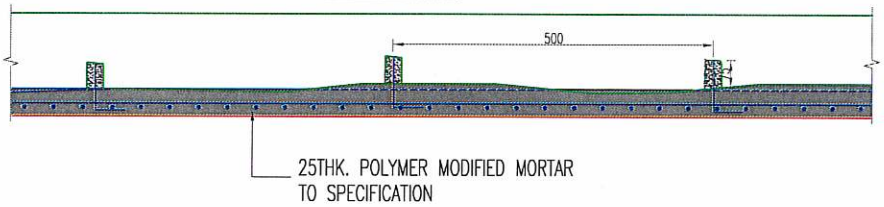
| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TREATMENT FOR WAIST SLAB** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/10 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26980200 | | CONTRACT NO: 17671143 | | |



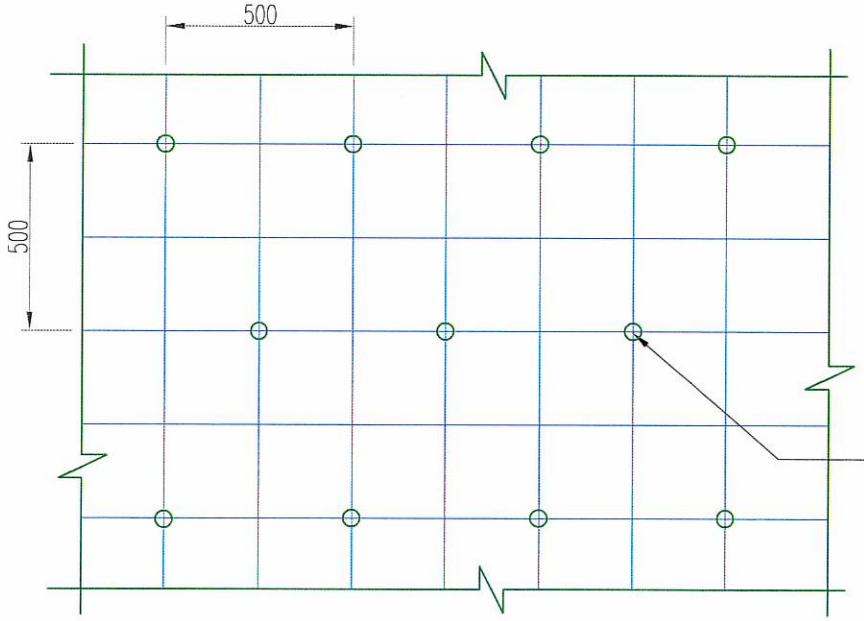

## STAGE – I



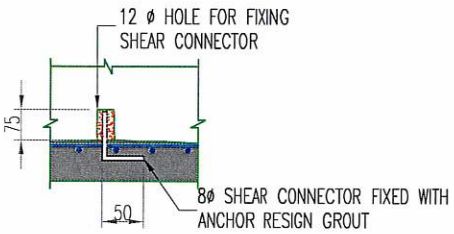

## STAGE – II




## STAGE – III

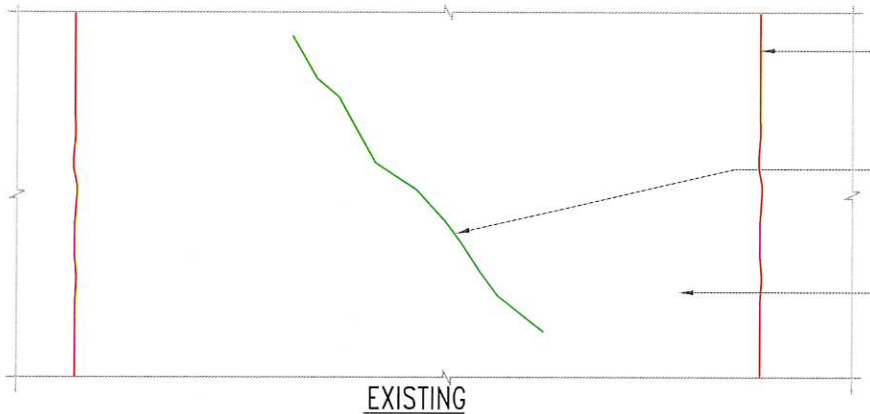



## PLAN– SHEAR CONNECTOR

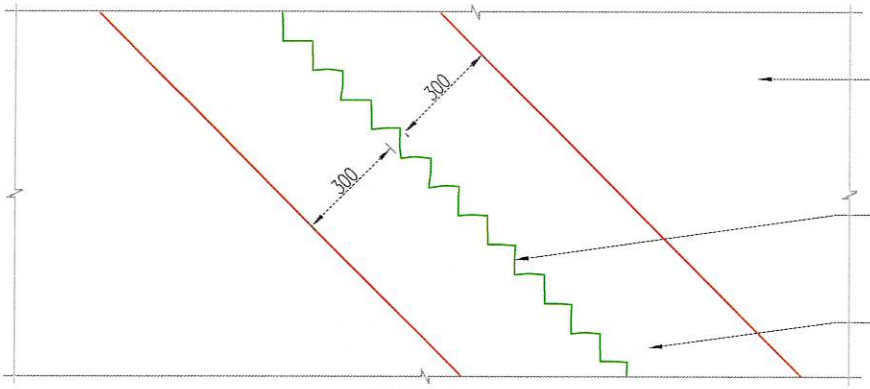



## DETAILS OF SHEAR CONNECTOR

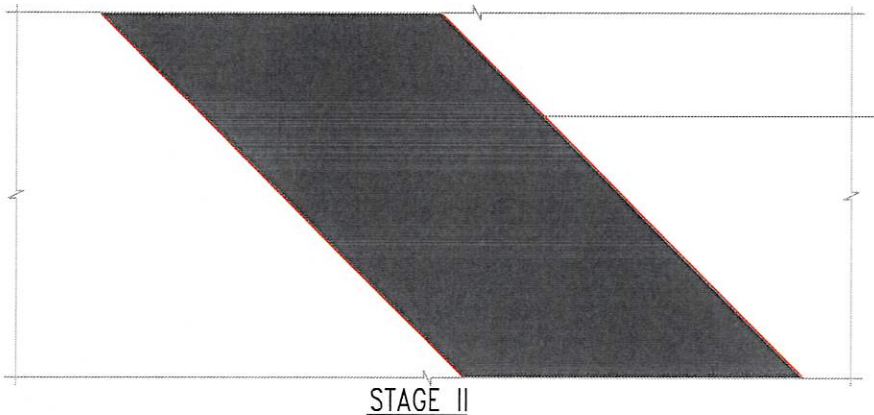
| | | | | | |
|---|---|---|---|---|---|
| TITLE | **SHOTCRETING FOR SLAB (BOTTOM)** | | | | |
| | | DATE | REV | DESCRIPION | |
| CLIENT | M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/11 | REV.No.: R0 |
| PROJECT | STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore – 560 070. Tel. : 080-26980200 | | CONTRACT NO: 17671143 | |




EXISTING

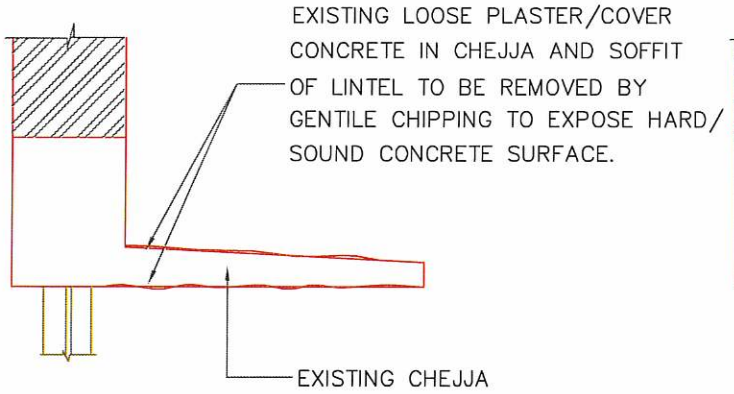



STAGE I

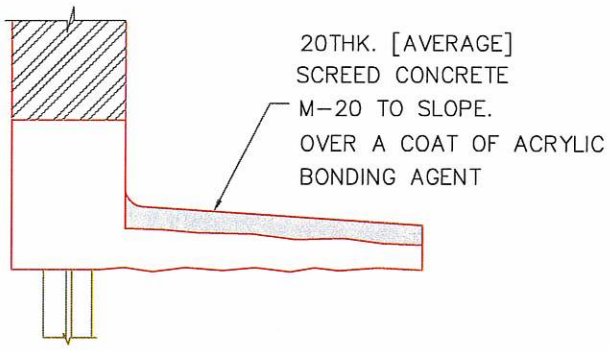



STAGE II

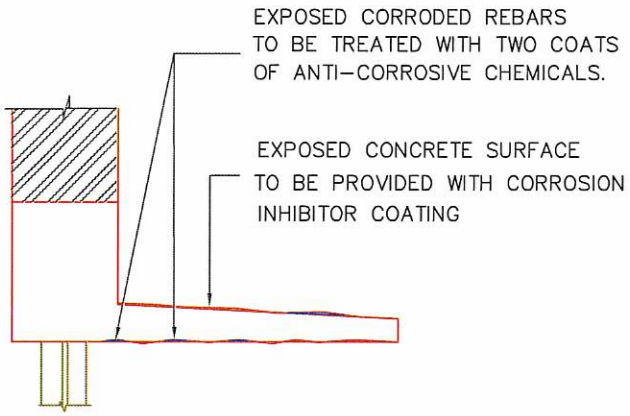
| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TREATMENT FOR CRACK IN MASONRY WALL** | | | | | |
| | | DATE | REV | DESCRIPION | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/12 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26980200 | | CONTRACT NO: 17671143 | | |



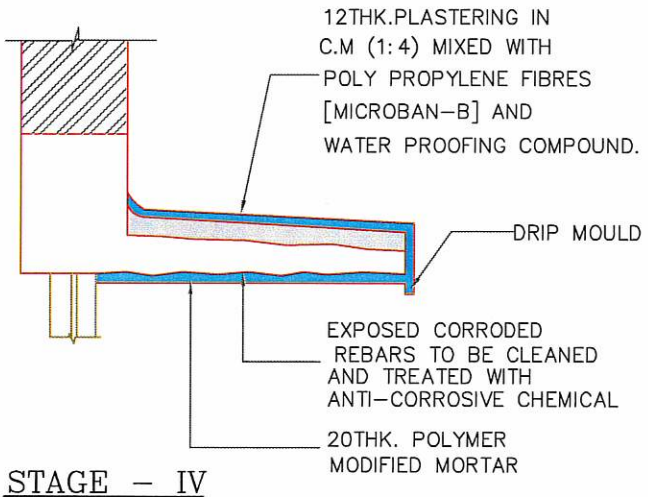

STAGE– I




STAGE – III

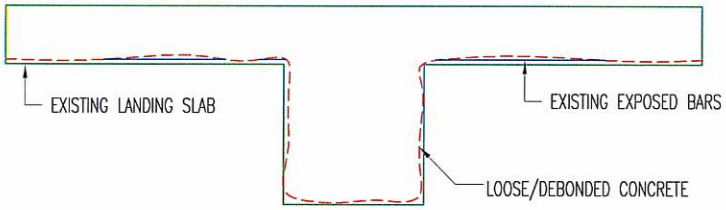



STAGE– II

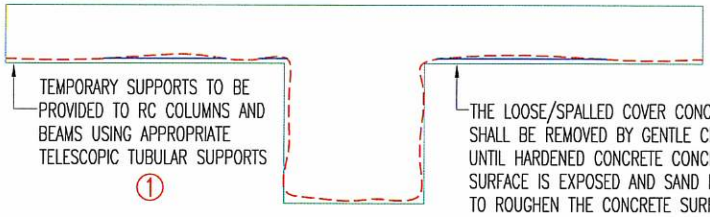



STAGE – IV

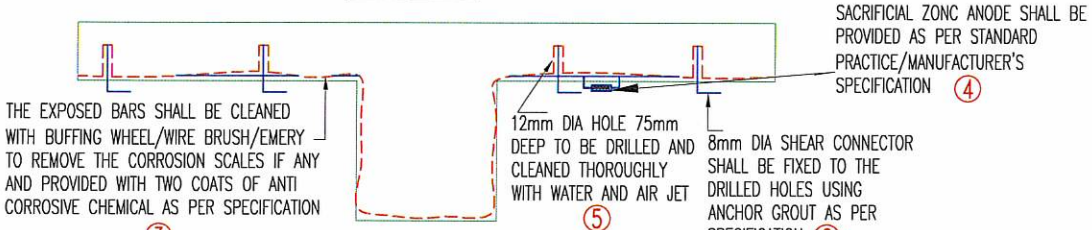
| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TREATMENT FOR CRACK IN CHEJJA** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/13 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Sanashankari 2nd Stage, Bangalore – 560 070. Tel. : 080–26980200 | | CONTRACT NO: 17671143 | | |



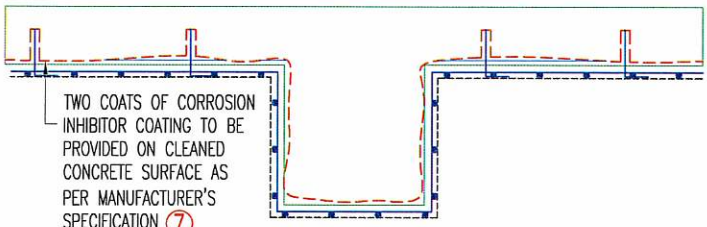

EXISTING



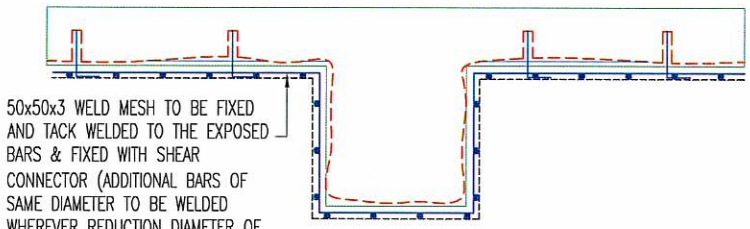

STAGE-1



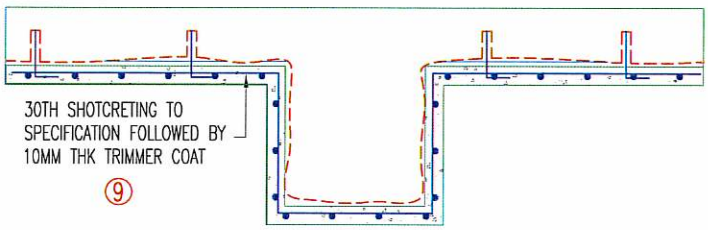

STAGE-2




STAGE-3

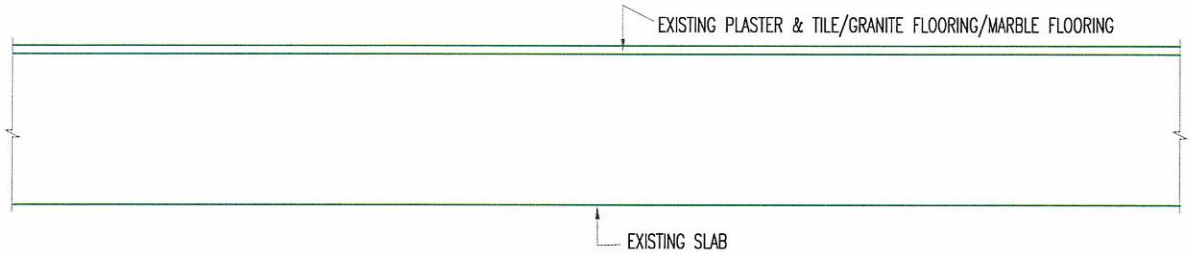



STAGE-4

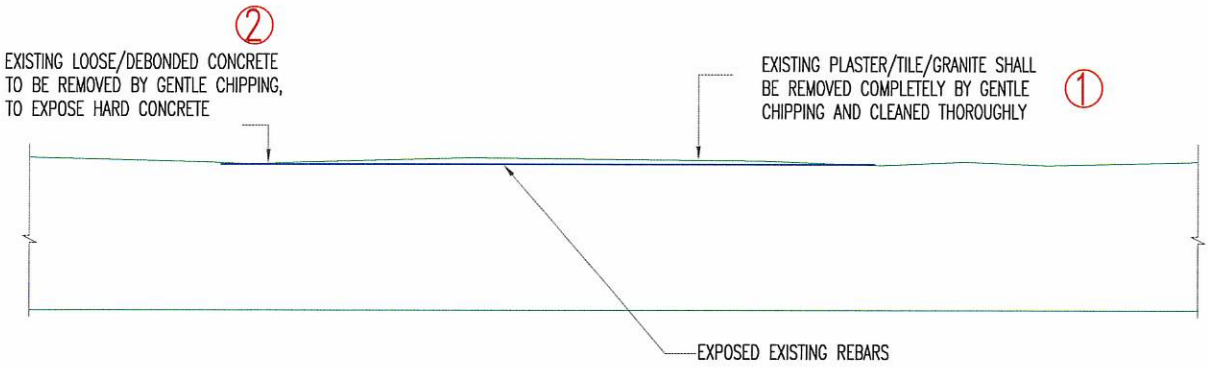



STAGE-5

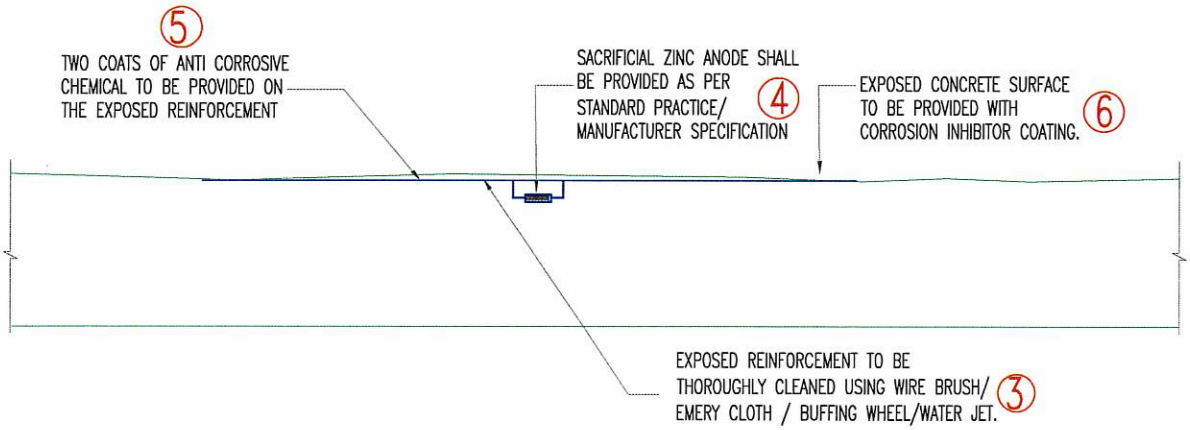
| | | | | | |
|---|---|---|---|---|---|
| TITLE: **SHOTCRETING FOR LANDING BEAM AND LANDING SLAB OF STAIRCASE** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/14 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26950200 | | CONTRACT NO: 17671143 | | |



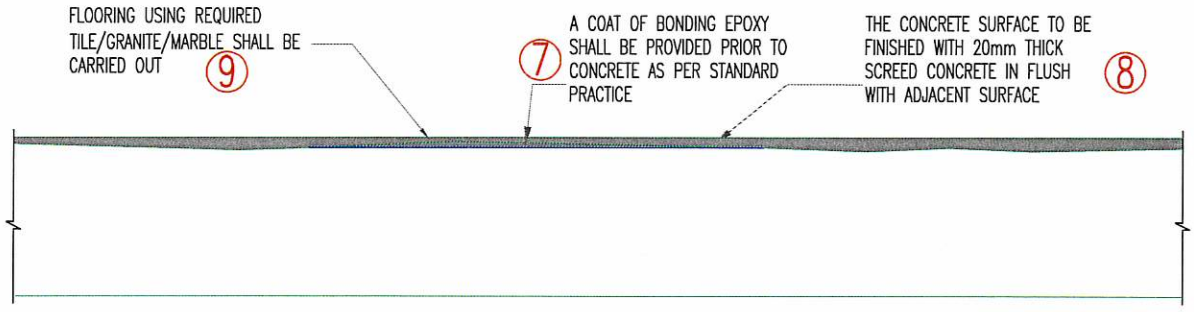

## EXISTING




## STAGE-I

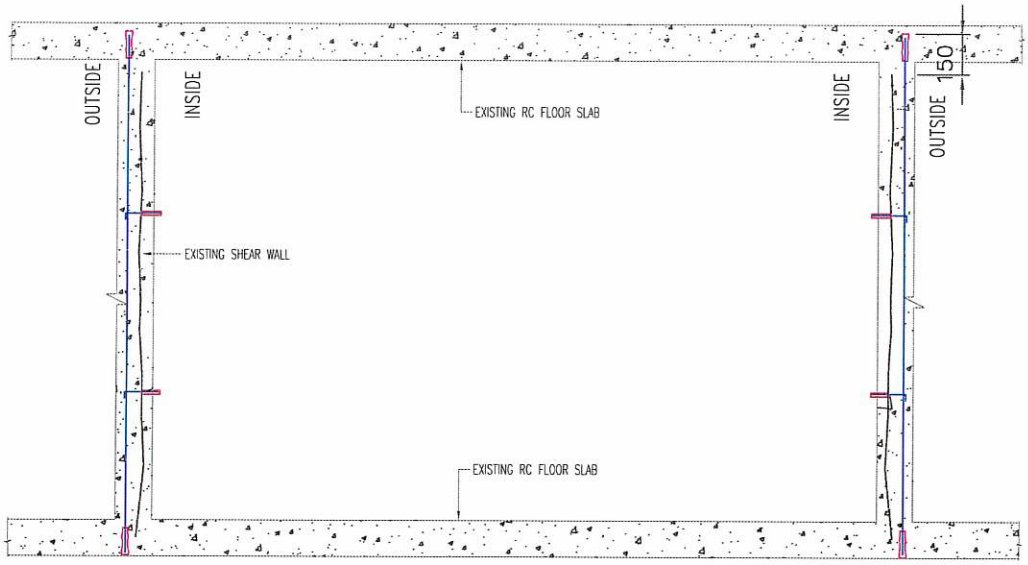



## STAGE – II

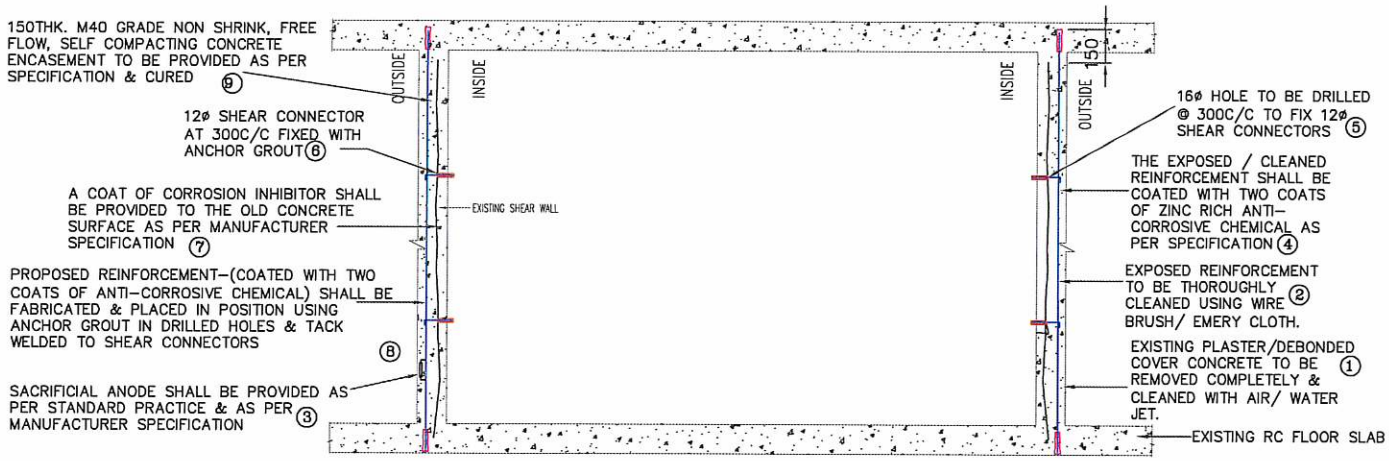



## STAGE – III

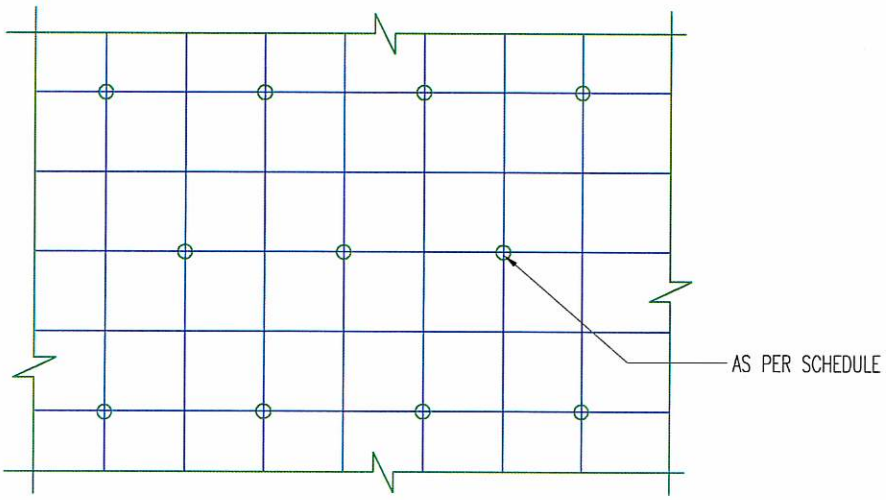
| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TREATMENT FOR CORROSION DISTRESSED SLAB** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/15 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore - 560 070. Tel. : 080-26980200 | | CONTRACT NO: 17671143 | | |




EXISTING SHEAR WALL

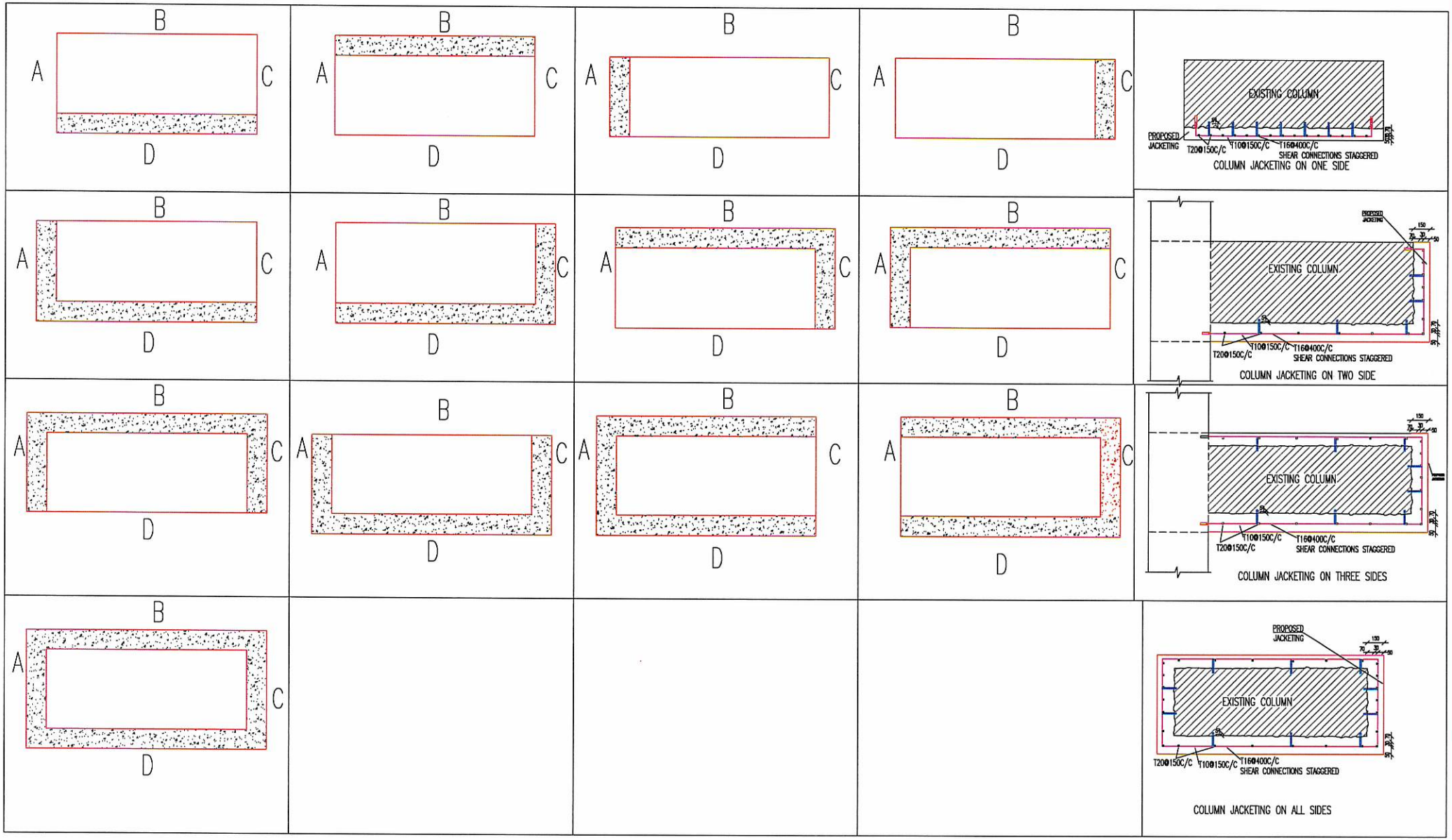



STAGE – 1




PLAN–SHEAR CONNECTOR

| | | | | | |
|---|---|---|---|---|---|
| TITLE: **TYPICAL SHEAR WALL ENCASEMENT** | | | | | |
| | DATE | REV | DESCRIPION | | |
| CLIENT: M/S ARMY WELFARE HOUSING ORGANISATION (AWHO) VYTILLA, KOCHI, KERALA | DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 | |
| | DESIGNED: | APPROVED: AJ | DWG. REF. No.: RM/16 | REV.No.: R0 | |
| PROJECT: STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA | CONSULTANTS: BUREAU VERITAS (INDIA) PVT. LTD. # 1030, 13th Cross, Banashankari 2nd Stage, Bangalore – 560 070. Tel. : 080–26980200 | | CONTRACT NO: 17671143 | | |




CLIENT

M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT

STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE

**SECTION SHOWING ENCASEMENT CONDITION FOR RECTANGULAR COLUMNS**

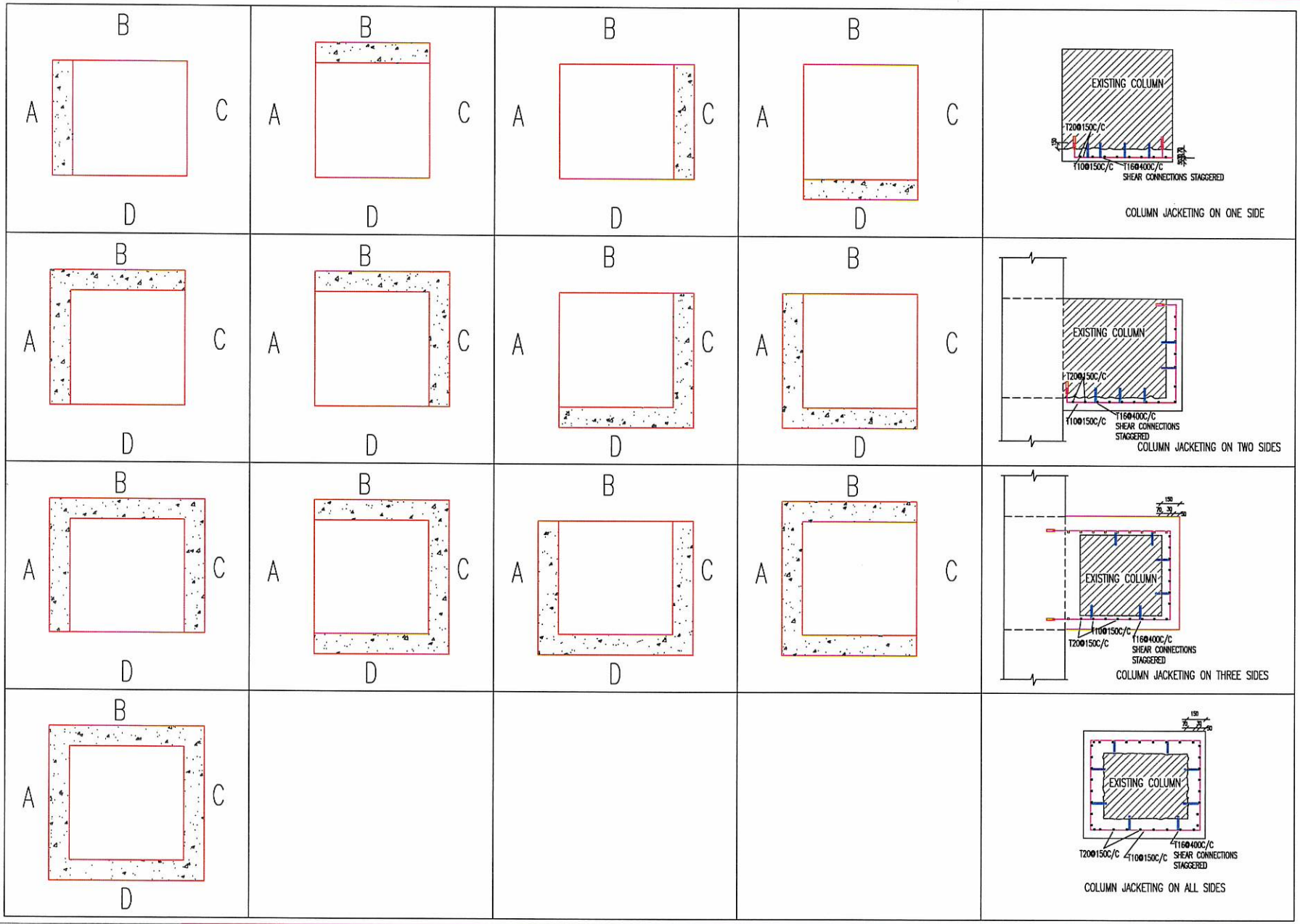
| | | | | | |
|---|---|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE NTS | DATE 24-04-2023 | | |
| | APPROVED: AJ | DWG. REF. No : RM/17 | REV.No. R0 | | |

CONSULTANTS

BUREAU VERITAS (INDIA) PVT. LTD.
# 1030, 13th Cross, Banashankari 2nd Stage, Bengaluru – 560 070.
Tel. : 080-26980200

CONTRACT NO

17671143




CLIENT

M/S ARMY WELFARE HOUSING ORGANISATION (AWHO)
VYTILLA, KOCHI, KERALA

PROJECT

STRUCTURAL ASSESSMENT OF RESIDENTIAL CHANDERKUNJ ARMY TOWERS OF ARMY WELFARE HOUSING ORGANISATION (AWHO) AT SILVER SAND ISLAND, VYTILLA, KOCHI, KERALA

TITLE

**SECTION SHOWING ENCASEMENT CONDITION FOR SQUARE COLUMNS**

| | | | |
|---|---|---|---|
| DRAWN: RSKK | CHECKED: CHR/MBS | SCALE: NTS | DATE: 24-04-2023 |
| | APPROVED: AJ | DWG. REF. No : RM/18 | REV.No. R0 |

CONSULTANTS

BUREAU VERITAS (INDIA) PVT. LTD.
# 1030, 13th Cross, Banashankari 2nd Stage, Bengaluru – 560 070.
Tel. : 080-26980200

CONTRACT NO

17671143

# SPECIFICATIONS

## SPECIFICATION FOR ANTI CORROSIVE CHEMICAL

| | | |
|---|---|---|
| **Type** | : | Zinc based two parts epoxy-phenolic / polyurethane coating suitable for application to ferrous surfaces |
| **Pot life** | : | Shall not be less than 6 hrs. at 25 °C -35 °C |
| **Consistency** | : | Brushable to form a continuous formation |
| **Requirements** | : | Shall be applied directly on the prepared surface of ferrous metal to achieve intimate contact with the base metal |
| **Wet film thickness (WFT)** | : | 135 microns (Min) |
| **Dry film thickness (DFT)** | : | 40 microns (Min) |
| **Surface preparation** | : | Wire brushing / buffing wheel / solvent free from chlorides or any suitable means |
| **Curing** | : | 45 minutes (air curing) |
| **Source of Anticorrosive chemical** | : | **"MasterEmacoP 130"**<br>M/s. BASF India Ltd.<br>Bangalore<br><br>**"CEMPATCH R"**<br>M/s. Don Construction Chemicals India Ltd.<br><br>**"Dr. Fixit Epoxy Zinc Primer"**<br>M/s. Pidilite Industries Ltd.<br><br>**"Nito Zinc primer"**<br>M/s. Fosroc Chemicals (India) Pvt. Ltd.<br><br>**"Nito Zinc primer"**<br>M/s. Krishna Conchem Products Pvt. Ltd.<br><br>**"Colusal MK" + "Colusal 25"**<br>M/s. MC Bauchemie (India) Pvt. Ltd.<br><br>**"Sika Top Armatec 108 / Friazinc R"**<br>M/s. Sika India Pvt. Ltd.<br><br>**or any equivalent** |

# SPECIFICATION FOR CORROSION INHIBITOR

| | | |
|---|---|---|
| **Type** | : | Concrete penetrating corrosion inhibitors |
| **Surface preparation** | : | Surface should be free from oil, laitance, grease, loose particles, etc. by wire brushing/ sand blasting/ water jet |
| **Service condition** | : | a. Shall resist carbon di oxide, chloride, sulphate and other dilute acids<br>b. Shall penetrate concrete to a min. of depth 200 mm and resist corrosion of embedded rebars<br>c. Shall be non-toxic and free from nitrate and Chromate |
| **Application** | : | Brushing / Spray gun |
| **Application dosage** | : | 2 to 4 $m^2/l$ or as per manufacturer specifications |
| **Available sources** | : | **"MasterProtect 8000CI"** from M/s. BASF India Ltd., Bangalore<br>**"Conplast CN"** M/s. Fosroc Chemicals (India) Pvt. Ltd.<br>**or any equivalent** |

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## SPECIFICATIONS FOR POLYMER MODIFIED MORTAR

| | | |
|---|---|---|
| **Type** | : | Structural grade polymer modified mortar (Pre packed dual shrinkage compensated) |
| **Material requirement** | : | Ready to use polymer modified cementatious mortar |
| **Mix proportion** | : | Mortar shall prepared be as per manufacturers recommendations |
| **Consistency** | : | Trowellable consistency |
| **Surface preparation** | : | Identified concrete surface shall thoroughly roughened by chipping, followed by water jet cleaning |
| **Bonding agent** | : | Surface shall be primed with acrylic bonding agent prior to application of mortar. |
| **Recommended thickness** | : | Not more than 12 mm per layer |
| **Curing** | : | Air curing |
| **Flexural strength** | : | Not less than 4.5 $N/mm^2$ |
| **Compressive strength** | : | Not less than 15 $N/mm^2$ for 7 days<br>Not less than 25 $N/mm^2$ for 28 days |
| **Recommended prepared polymer modified mortar** | : | **"MasterEmaco S348"**<br>M/s. BASF India Ltd.<br><br>**"Cempatch HM"**<br>M/s. Don Construction Chemicals India Ltd.<br><br>**"Dr. Fixit Polymer Mortar HB"**<br>M/s. Pidilite Industries Ltd.<br><br>**"Renderoc S2"**<br>M/s Fosroc Chemicals (India) Pvt. Ltd.<br><br>**"Sika Top 122.HS"**<br>M/s. Sika India Pvt. Ltd.<br><br>**or any equivalent** |

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## SPECIFICATION FOR ANCHOR GROUT

| | | |
|---|---|---|
| **Connecting material** | : | Fe-415 grade steel |
| **Diameter of hole to be drilled in concrete** | : | As detailed in sketch |
| **Depth of embedment** | : | As detailed in sketch |
| **Anchoring medium** | : | Quick setting polyester resin anchor grout |
| **Curing time** | : | 24 hours minimum (air curing) |
| **Source of resin grout available** | : | **"Masterflow 935"** from M/s. BASF India Ltd., Bangalore<br><br>**"Dr. Fixit Anchorfix P&S"** M/s. Pidilite Industries Ltd. Bangalore<br><br>**"Lokfix S / L / P"** from M/s. Fosroc Chemicals (India) Ltd. Bangalore<br><br>**"EP310"** M/s. ARDEX Endura<br><br>**or any other equivalent** |
| **Compressive strength of anchor grout** | : | 20 N/sq.mm in 5 hrs. @ 30 °C<br>75 N/sq.mm in 7 days |
| **Type of equipment for drilling** | : | Rotary-cum-Hammering action electrically operated drilling machine with masonry drill bits. |
| **Source of equipment for drilling in concrete** | : | Electrix (India) Pvt. Ltd. Bangalore<br><br>BOSCH Ltd. Bangalore<br><br>HILTI India Ltd. Bangalore<br><br>**or any equivalent** |

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## SPECIFICATION FOR SHEAR CONNECTORS

| | | |
|---|---|---|
| **Material for connector** | : | Deformed rebar (Fe 415) |
| **Diameter of connector** | : | As specified in drawing |
| **Diameter of holes to be drilled in concrete** | : | As specified in drawing |
| **Depth of embedment** | : | As specified in drawing |
| **Cleaning of drilled holes** | : | Air and water jet |
| **Anchoring medium** | : | a. Quick setting polyester resin anchor grout<br>b. Ready to use epoxy putty |
| **Setting time** | : | a. Less than 30 minutes in case of polyester resin grout<br>b. Not more than 24 hours in case of epoxy putty |
| **Suggested commercial anchoring media** | : | **"MasterFlow 935"**<br>M/s. BASF India Ltd., Bangalore<br><br>**"Keygrout"**<br>M/s. Don Construction Chemicals India Ltd.<br><br>**"Dr. Fixit Anchorfix P/S"**<br>M/s. Pidilite Industries Ltd.<br><br>**"Lokfix L/P/S"**<br>Over head & Horizontal – Gun grade<br>M/s. Fosroc Chemicals (India) Pvt. Ltd.<br><br>**"EP310"**<br>M/s. ARDEX Endura<br><br>**or any equivalent** |
| **Recommended pull out force** | : | 500 kg. minimum |
| **Type of equipment for drilling** | : | Electrically operated rotary-cum-hammering action drilling machine |

Contd/....

| | | |
|---|---|---|
| **Recommended drilling equipment from** | : | a. Electrix India Ltd.<br>b. Hitachi Koki India Ltd.<br>b. Hilti India Ltd.<br>c. MICO Bosch Ltd.<br>**or any equivalent** |
| **Type of drill bits** | : | Tungstun Carbide |
| **Recommended brand** | : | a. MICO Bosch<br>b. Hilti India Ltd. **or any equivalent** |

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## SPECIFICATION FOR
## WATER PROOF PLASTER

| | | |
|---|---|---|
| **Thickness** | : | 20 mm |
| **Mix Proportion** | : | 1 cement to 4 sand by weight |
| **Water cement ratio** | : | 0.45 (maximum) |
| **Admixture** | : | Chloride free integral waterproofing Admixture conforming to IS:2645-1975 (Reaffirmed 1999)<br><br>**"MasterPel 707"** from M/s. BASF India Ltd., Bangalore<br><br>**"Dr. Fixit Pidiproof LW+"** M/s. Pidilite Industries Ltd.<br><br>**"Setseal tanking"** M/s. Don Construction Chemicals India Ltd.<br><br>**"Conplast X 421 IC"** from M/s. Fosroc Chemicals (India) Ltd.<br><br>**"Dichtament DM"** from M/s. MC-Bauchemie (India) Pvt. Ltd.<br><br>**"Sika – 1"** from M/s. Sika Qualcrete Pvt. Ltd.<br><br>**or equivalent** |
| **Dosage of Admixture** | : | As per manufacturer's specification |
| **Curing period** | : | 14 days (minimum) |

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# SPECIFICATION FOR WELD MESH

| | | |
|---|---|---|
| **Reference** | : | Indian Standard Specification<br>IS: 1566-1982 reaffirmed in 2000 |
| **Wire diameter** | : | 3 mm |
| **Size of openings** | : | 50 x 50 x 3 mm |
| **Type** | : | Spot welded non-galvanised mesh |
| **Ultimate tensile strength of wire** | : | 3800 kg/cm$^2$ min. |
| **Elongation** | : | 20 percent min. |

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BUREAU VERITAS

## SPECIFICATION FOR MIXING WATER

| | | |
|---|---|---|
| **Reference** | : | Indian Standard Specification<br>IS: 456-2000 |
| **Quality** | : | Potable quality |
| **pH Value** | : | Not less than 6.0 |
| **Organic solids** | : | 200 mg/l max. |
| **Inorganic solids** | : | 3000 mg/l max. |
| **Sulphates (as $SO_3$)** | : | 400 mg/l max |
| **Chlorides (as Cl)** | : | 500 mg/l max. for reinforced concrete<br>2000 mg/l max. for plain cement concrete |
| **Suspended matters** | : | 2000 mg/l max. |
| **Quantity of 0.02 N NaOH Required to neutralize 100 ml of water sample using Phenolphthalein as an indicator:** | : | Shall not be more than 5 ml |
| **Quantity of 0.02 N $H_2SO_4$ Required to neutralize 100 ml of water sample using mixed indicator:** | : | Shall not be more than 5 ml |

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## SPECIFICATION FOR EPOXY INJECTION / GROUTING

| | | |
|---|---|---|
| **Reference** | : | ASTM - 881 - 87<br>Type I, Grade I, Class B or C. |
| **Type of Epoxy** | : | Low viscosity solvent free prepacked resin and hardener, free flow epoxy system after mixing. |
| **Viscosity** | : | Mix viscosity 800 mPa maximum at 25° C. |
| **Pot life** | : | Not less than 45 minutes |
| **Compressive strength after 7 days curing at 25° C** | : | Not less than 75 N/Sq.mm |
| **Injection equipment** | : | Electrically operated or Compressed air driven injection pump with suitable syringe system, fitted with suitable pressure gauge. |
| **Operating pressure** | : | 3 – 4 Kg/Sq.cm |
| **Available sources** | : | **"MasterInject 1315"** from<br>M/s. BASF India Ltd., Bangalore<br><br>**"Dr. Fixit Epoxy Injection Grout"**<br>M/s. Pidilite Industries Ltd.<br><br>**"Quickmast 231"**<br>M/s. Don Construction Chemicals India Ltd.<br><br>**"Conbextra EP10"** from<br>M/s. Fosroc Chemicals (India) Ltd., Bangalore<br><br>**"KP 250"** from<br>M/s. Krishna Conchem Products Pvt. Ltd., Mumbai<br><br>**"Sikadur 52"** from<br>M/s. Sika Qualcrete Pvt. Ltd., Bangalore<br><br>**or any equivalent** |

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## SPECIFICATION FOR ELASTOMERIC SEALANT FOR SEPARATION CRACK

| | | |
|---|---|---|
| **Type of sealant** | : | Two part elastomeric waterproof sealant |
| **Tensile strength** | : | 1.50 to 1.70 N/sq.mm |
| **Elongation** | : | 600 to 700 % |
| **Movement accommodation** | : | ±25 to 40% |
| **Pot life** | : | Not less than 30 minutes |
| **Full cure** | : | 7 to 10 days max. (as per manufacturer's specification) |
| **Shore A hardness** | : | 18 to 23 at 25° C |
| **Pressure resistance** | : | 6 to 8 m hydrostatic head |
| **Application temperature** | | |
| **Range** | : | 10° C to 50° C |
| **Density** | : | 1.60 to 1.70 Kgs / litre |
| **Solid content** | : | 100% (Max.) |
| **Resistance of exposure** | : | Shall not degrade when exposed to Ultra-Violet radiation and weathering |
| **Service condition** | : | i) Shall be resistant to abrasion<br>ii) Shall be impermeable to water when sealed<br>iii) Shall be non-corrosive type<br>iv) Shall be non-toxic and food grade |
| **Life** | : | Shall be durable for a minimum period of 5 years (Guarantee period) |
| **Technical reference** | : | BS - 4254 - 1983 or equivalent |
| **Available sources** | : | **"Masterflex 472/474"** from M/s. BASF India Ltd., Bangalore<br><br>**"Dr. Fixit PU Sealant"** M/s. Pidilite Industries Ltd.<br><br>**"Nitoseal PU – Polyurethen selant"**<br>**"Thioflex 600 – Polysulphide sealant"**<br>**"Nitoseal MS 600 – Hybrid Silyl Modified Polyether** M/s. Fosroc Chemicals (India) Pvt. Ltd., Bangalore<br><br>**or any equivalent** |

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## SPECIFICATION FOR

## ANTI CARBONATION PROTECTIVE COATING

| | | |
|---|---|---|
| **Type** | : | Durable and protective coating applicable on concrete surface |
| **Consistancy** | : | Brushable to form a continuous coat formation |
| **Surface preparation** | : | Surface should free from oil, latence, dust etc. cleaned by wire brushing / water jet / sand blasting. |
| **Pot life** | : | 30 to 60 minutes |
| **Service condition** | : | i) Shall resist carbon dioxide, chloride and sulphate ion penetration.<br>ii) Allow water vapour to escape from structure<br>iii) Shall not degrade but remain stable when exposed to U-V radiation and weathering<br>iv) Shall be Non - toxic<br>v) Coating shall be flexible and possess crack accommodating capacity |
| **Curing** | : | As per manufacturer's specification |
| **Available Sources** | : | **"MasterProtect 399 / (200/300)"** from M/s. BASF India Ltd., Bangalore<br>**"Dr. Fixit Concrete Guard"** M/s. Pidilite Industries Ltd.<br>**"Repcoat"** M/s. Don Construction Chemicals India Ltd.<br>**"Deckguard S"** from M/s. Fosroc Chemicals India Pvt. Ltd.<br>or any equivalent |

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BUILDING TRUST

PRODUCT DATA SHEET

# Sika® Injection-203

Elastic PUR-Injection resin for permanent watertight sealing

## DESCRIPTION

Sika® Injection-203 is a low viscous, elastic and solvent-free polyurethane injection resin, which cures in both dry and wet conditions to form an elastic, watertight filling and sealing material.

## USES

Sika® Injection-203 may only be used by experienced professionals.

- Sika® Injection-203 is used for permanent watertight sealing with some flexibility of dry, damp or water-bearing cracks and joints in concrete, brickwork and natural stonework
- Sika® Injection-203 can be used for the injection of the SikaFuko® System (non re-injectable)
- For use in water-bearing cracks under hydrostatic pressure, preliminary injection shall be made with Sika® Injection-101 RC

## CHARACTERISTICS / ADVANTAGES

- Permanently elastic, can absorb limited movement
- No shrinkage in subsequent dry conditions
- Due to its low viscosity it can penetrate into narrow cracks starting from 0.2 mm in width
- Cured Sika® Injection-203 is inert and chemically-resistant
- Solvent-free, usable in ground water zones
- At cold temperature (less than 10 °C) Sika® Injection-203 can be accelerated using Sika® Injection-AC20
- Can be injected as a one component system

## APPROVALS / STANDARDS

- German ZTV-ING chapter 3, part 5 (RISS) tested (BASt listed)
- German KTW drinking water certificate
- Concrete injection for ductile filling of cracks, voids and interstices (D) according to EN 1504-5:2004, Declaration of Performance 57838186, certified by notified factory production control certification body 0761 and provided with the CE marking.

## PRODUCT INFORMATION

| | | | |
|---|---|---|---|
| **Chemical Base** | Solvent free, water reactive 2-component polyurethane resin | | |
| **Packaging** | Component A | 10.0 and 20.0 kg | |
| | Component B | 5.5 and 11.0 kg | |
| **Colour** | Component A | yellow | |
| | Component B | brown | |
| **Shelf Life** | 24 months shelf life from date of production if stored properly in undamaged, unopened, original sealed packaging. | | |
| **Storage Conditions** | Dry storage at temperatures from +5 °C up to +35 °C. Protect from direct sunlight and humidity. | | |
| **Density** | Component A | ~0.97 kg/l | (ISO 2811)) |
| | Component B | ~1.10 kg/l | |

## ECOLOGY HEALTH AND SAFETY

For information and advice on the safe handling, storage and disposal of chemical products, users shall refer to the most recent Safety Data Sheet (SDS) containing physical, ecological, toxicological and other safety-related data.

## LEGAL NOTES

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request. It may be necessary to adapt the above disclaimer to specific local laws and regulations. Any changes to this disclaimer may only be implemented with permission of Sika® Corporate Legal in Baar.

**Sika South Africa (Pty) Ltd**
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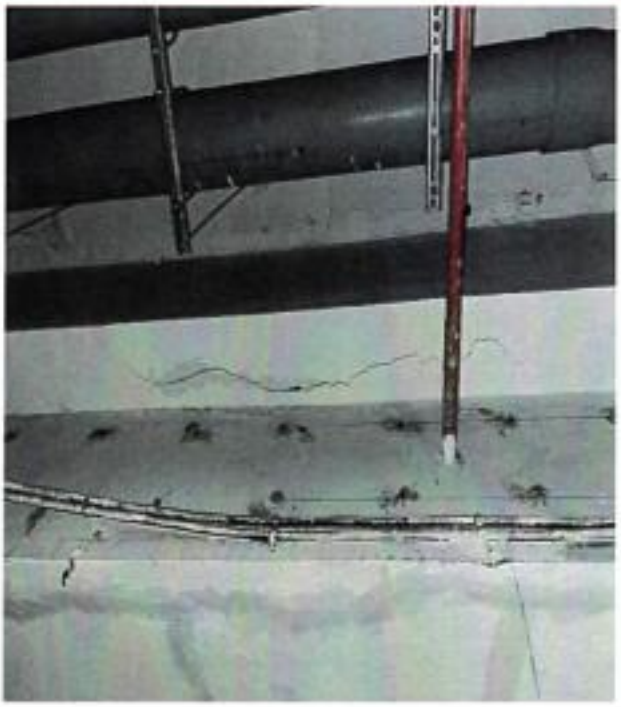
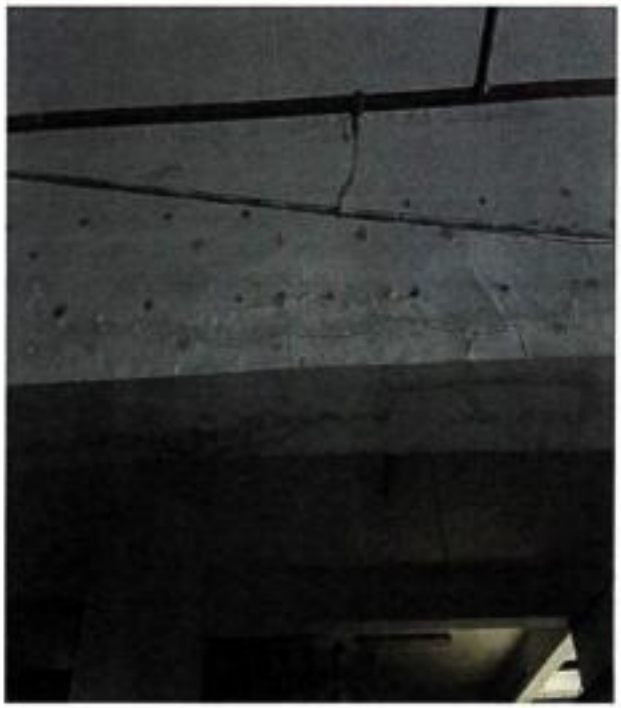
Westmead, 3608
South Africa
Phone +27 31 792 6500
www.sika.co.za

BUREAU VERITAS

# PHOTOGRAPHS OF VISUAL INSPECTION/OBSERVATIONS

## PHOTOGRAPHS





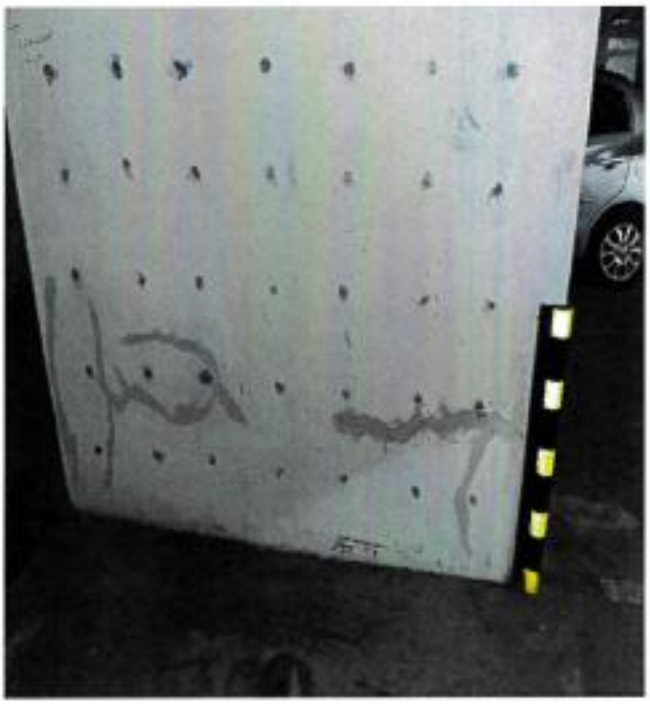
View of cracks in Basement floor RC beams

## PHOTOGRAPHS

View of spalling of cover concrete in Basement floor RC beams

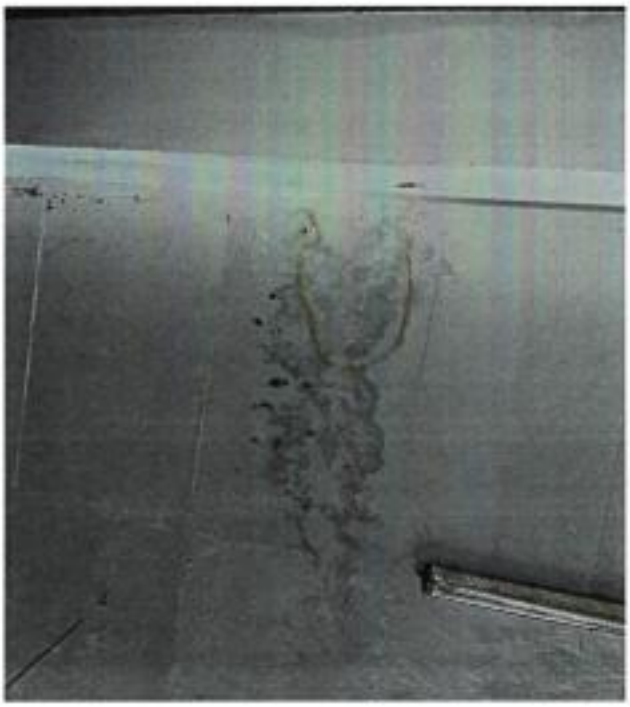
View of cracks in Basement floor RC columns

## PHOTOGRAPHS



**View of cracks in Basement floor RC columns**

## PHOTOGRAPHS



**View of cracks & debond of cover concrete in Basement floor RC Slab**

## PHOTOGRAPHS

View of spalling of cover concrete in Basement floor RC Slab

View of dampness/ damp patches & peeling of paint in Basement floor RC Slab

## PHOTOGRAPHS

View of dampness/ damp patches & peeling of paint in Basement floor RC Slab

View of dampness/ damp patches & peeling of paint in Basement floor RC retaining wall

## PHOTOGRAPHS

**View of dampness & oozing of water in Basement floor RC retaining wall**

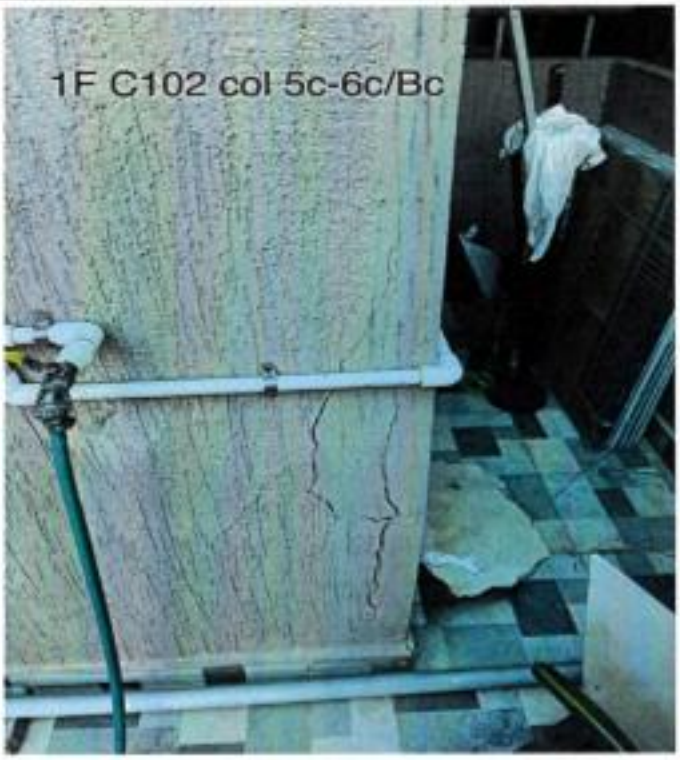
## PHOTOGRAPHS

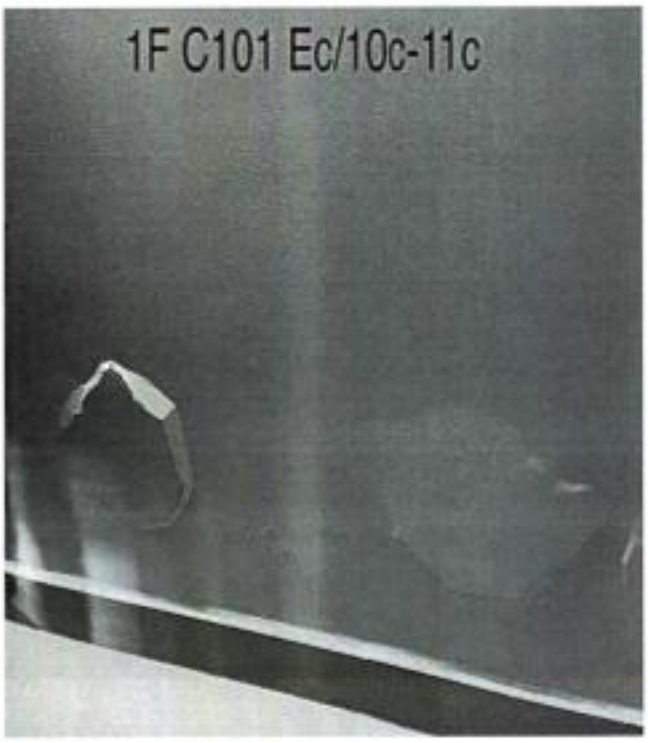
View of Corrosion Cracks & Spalling of cover concrete in RC Staircase Waist Slab

## PHOTOGRAPHS

**View of Corrosion Cracks in RC Columns at Ground Floor**

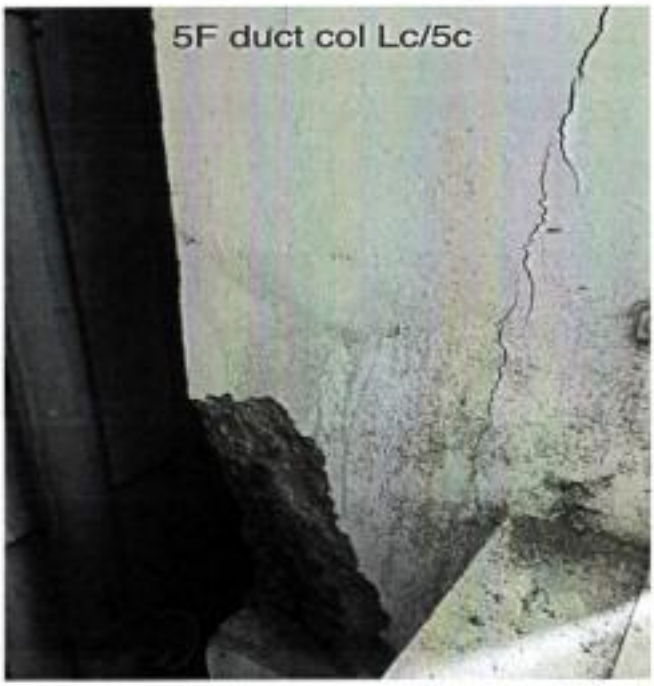
## PHOTOGRAPHS

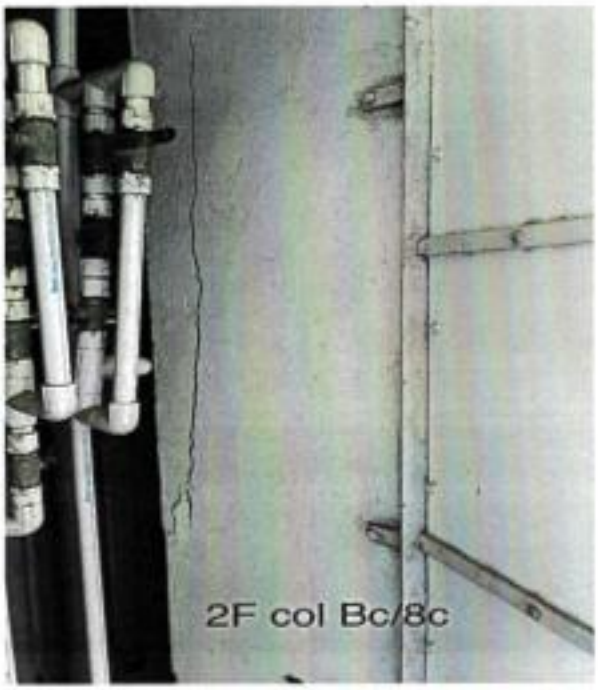



**View of Corrosion Cracks & Debond of cover concrete in RC Columns**

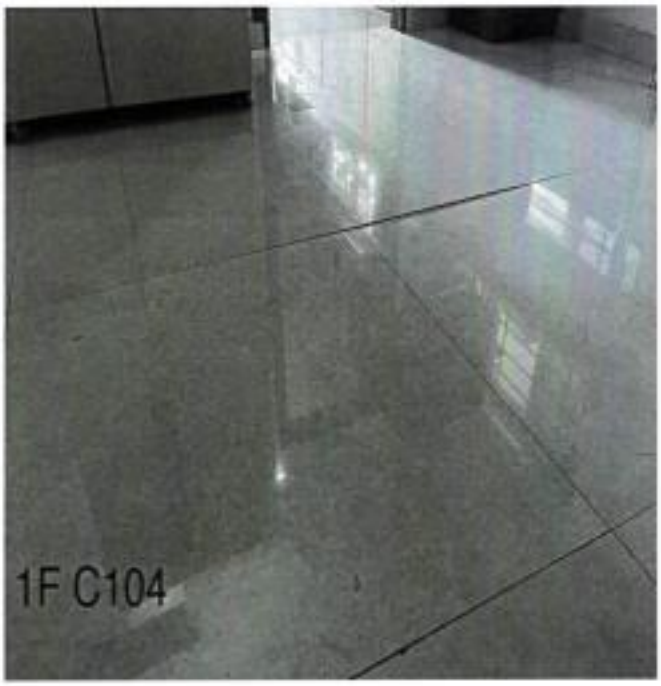
## PHOTOGRAPHS




**View of Corrosion Cracks & Spalling of cover concrete inside duct RC Columns**

## PHOTOGRAPHS

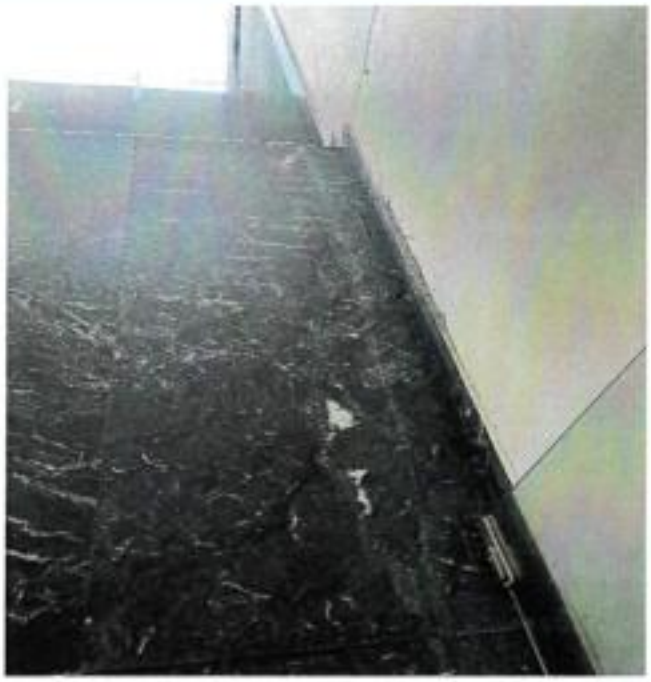


**View of Popping up of tiles inside the flats**

## PHOTOGRAPHS

**View of Popping up of tiles inside the flats**

## PHOTOGRAPHS



View of popping of marble in Ground Floor

View of debond of granite cladding around lift shear wall

## PHOTOGRAPHS

View of debond of granite cladding around lift shear wall

View of popping up of marble in staircase region

## PHOTOGRAPHS

**View of dampness/ damp patches/ peeling of paint in RC beams of toilet region**

**View of dampness/ damp patches/ peeling of paint in masonry walls of toilet region**

## PHOTOGRAPHS

**View of cracks/ debond of plaster in RC chejjas**

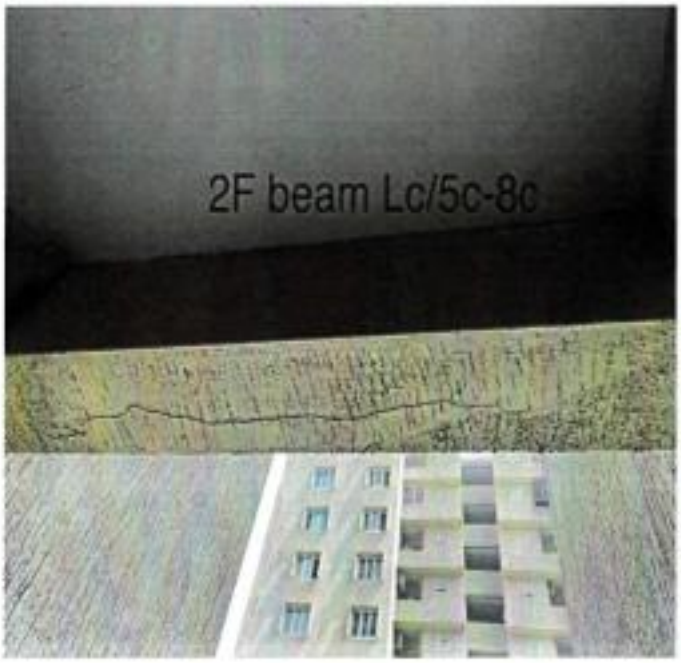
## PHOTOGRAPHS

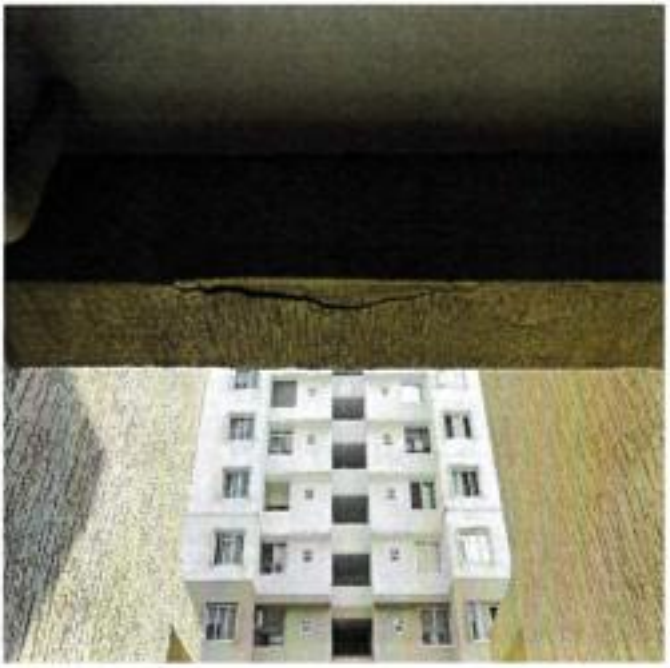
View of debond & spalling of cover concrete in RC Shear Wall

View of cracks in balcony parapet wall

View of cracks in lintel beam

## PHOTOGRAPHS



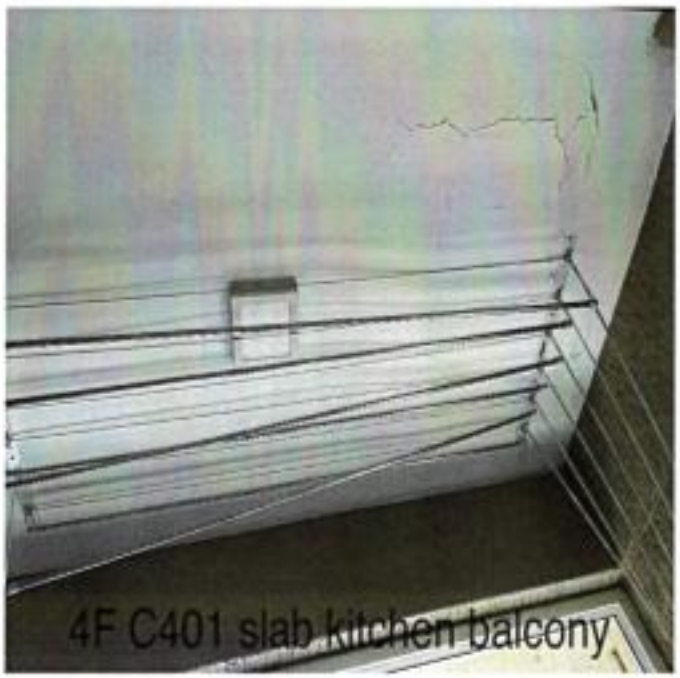



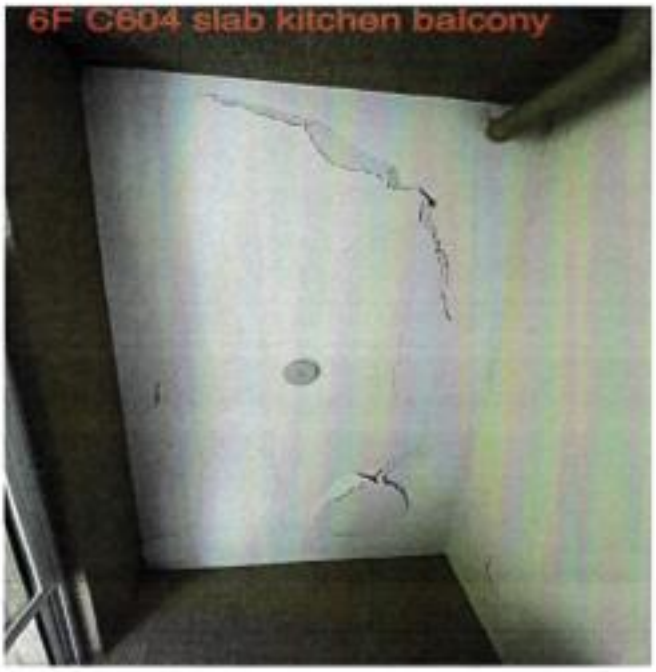
**View of cracks & spalling of cover concrete in balcony/ refuge area RC Beams**

## PHOTOGRAPHS

View of cracks in duct beam

View of spalling of cover concrete in balcony RC Slab




View of cracks & debond of cover concrete in balcony RC Slab

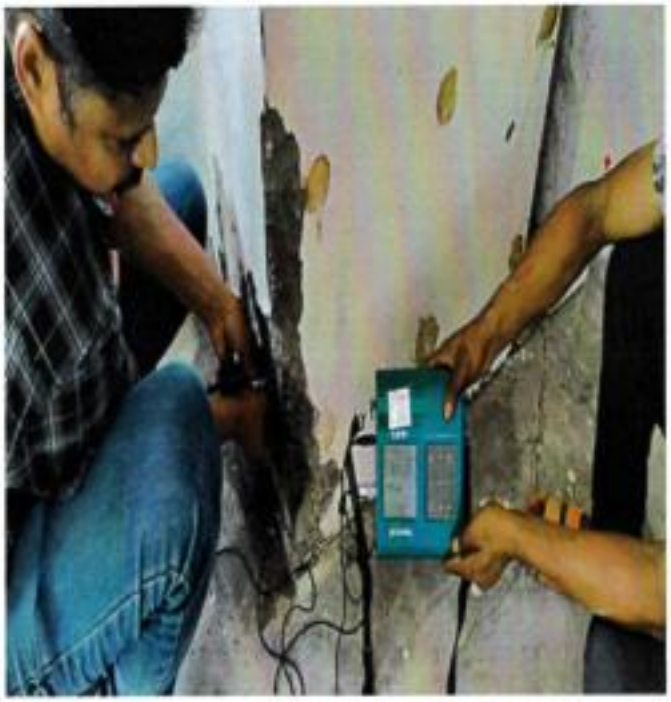
# TESTING PHOTOGRAPHS

## TESTING PHOTOGRAPHS

View of Ultrasonic Pulse Velocity Test under progress

## TESTING PHOTOGRAPHS

View of Ultrasonic Pulse Velocity Test under progress



View of Ultrasonic Half Cell Potential Measurement under progress

## TESTING PHOTOGRAPHS

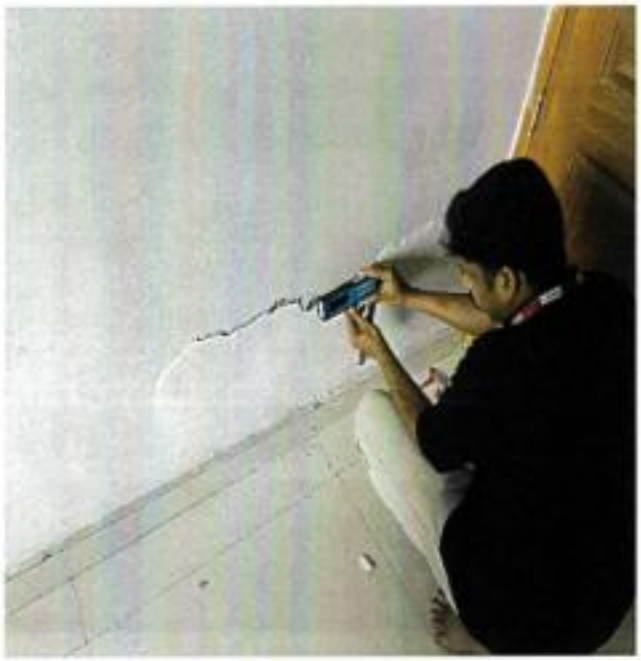
**View of Rebound Hammer Test under progress**

## TESTING PHOTOGRAPHS

View of Rebound Covermeter Test under progress

View of Carbonation Test

## TESTING PHOTOGRAPHS



View of Resipod Test under progress

## TESTING PHOTOGRAPHS

View of Resipod Test under progress

## TESTING PHOTOGRAPHS

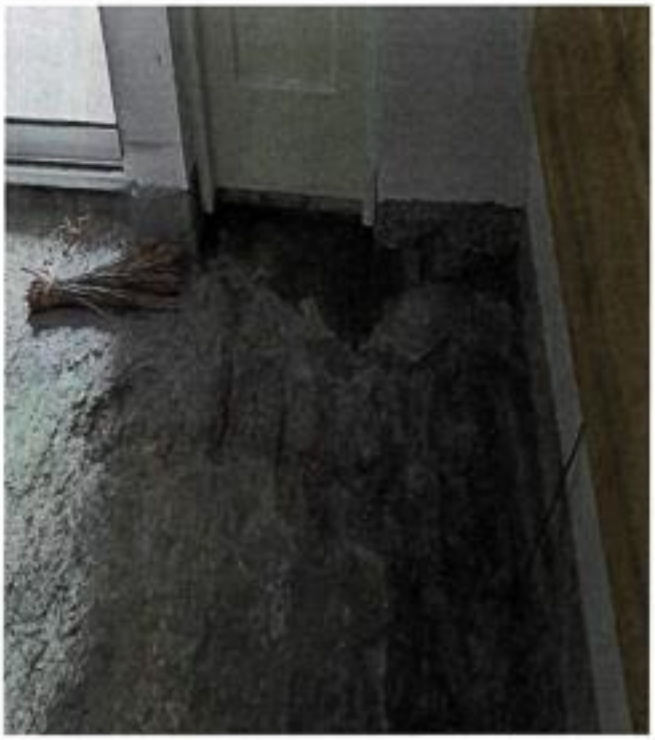
**View of Concrete Core Extraction under progress**

## TESTING PHOTOGRAPHS

View of View of Concrete Core Extraction under progress

# PHOTOGRAPHIC EVIDENCE AND DISTRESS LIST SHARED BY FLAT OCCUPANTS

**Photographs Shared by Flat Owners**



**Photographs Shared by Flat Owners**

**Photographs Shared by Flat Owners**

## MASTER LIST – BV STRUCTURAL SURVEY

| Ser No | Flat No. | Nature of complaint |
|---|---|---|
| 1 | A 0103 | Cracks and seepage near the bathrooms.<br>Plastering peeling from the ceiling of drawing room and bedrooms.<br>Plaster peeling noted in the wall at the entrance to the house. |
| 2 | A 0702 | Seepage along the wall. |
| 3 | A 1103 | Plastering peeling off. |
| 4 | A 1201 | Cracks in balcony shades in all balconies. |
| 5 | A 1404 | 1 Mtr crack on left wall above the window of DH.<br>Two cracks appox. 1.5 Mtr on Northern wall of BR no.2<br>Continuous wall crack of around 2.5 mtr on the common wall of BR and kitchen<br>Crack of appox. 80 cm on the right top wall of BR balcony.<br>Water seepage from terrace of hall balcony<br>Water seepage from terrace in kitchen balcony and seepage on the walls. |
| 6 | B 0101 | Cracks were observed in balcony Chejja exterior portion. |
| 7 | B 0102 | Cracks on wall seen at many places inside the flat.<br>Plaster peeling off many places. |
| 8 | B 0104 | Few cracks seen towards entry of first floor.<br>Patch up and crack in staircase waist slab opp. To lift No.3 |
| 9 | B 0304 | Crack in Kitchen wall<br>Living room balcony wall crack<br>Kitchen balcony sunshade crack.<br>Seepage in both bathroom |
| 10 | B 0403 | Crack in Beam balcony |
| 11 | B 0601 | Gross seepage in 2nd bedroom walls.<br>Foul smell coming occasionally. |
| 12 | B 0602 | Rainwater seepage in to the western wall of Master BR from external cracks and window frame.<br>Crack about 1 Mtr long on the western wall of Master BR<br>Cracks of about 80 cm on the wall of Dining Hall<br>1 Mtr long, deep crack in the kitchen balcony sunshade. Another 50 cm long crack on the same sunshade. |
| 13 | B 0603 | Crack in balcony |
| 14 | B 0703 | Balconies have serious cracks. |
| 15 | B 0704 | Crack in Beam (Bedroom) and slab.<br>Cracks observed in Chejja exterior portion. |
| 16 | B 0904 | Crack in Chejja exterior portion. |
| 17 | B 1002 | The walls of the main bed room is completely soaked due to the attached washrooms. Need water proofing. |
| 18 | B 1002 | Crack on Main bedroom wall<br>Seepage in walls. |
| 19 | B 1101 | Two cracks in bedroom wall (1 mtr & .5 mtr )<br>Seepage in the 1st bedroom wall & exterior sunshade.<br>Crack in the tiles of 1st bedroom balcony. |
| 20 | B 1104 | Crack in beam in balcony kitchen |
| 21 | B 1204 | 1 Mtr crack in the pillar in Master BR. |

| Ser No | Flat No. | Nature of complaint |
|---|---|---|
| | | 1.5 Mtr crack in work area ceiling.<br>1 Mtr long crack on sunshade of Master BR and balcony<br>Plaster peeling off from guest bedroom walls. |
| 22 | B 1404 | Crack in RC Beam in balcony & Crack in balcony wall.<br>Dampness/damp patches in wall. |
| 23 | B 1504 | 1Mtr long crack on balcony sunshade.<br>.8 mtr long crack on kitchen balcony.<br>1.1 Mtr long crack on kitchen wall.<br>Long crack on kitchen out side wall.<br>Crack in Master bedroom balcony left & right side. |
| 24 | B 1601 | Crack in the kitchen beam.<br>Crack at sunshade outside main bedroom, master bedroom. |
| 25 | B 1904 | Paint blistering and peeling. |
| 26 | B 2501 | Crack in exterior surface wall<br>Spalling of concrete and exposure of rebar in slab at balcony portion. |
| 27 | B 2503 | Line crack on the wall of 2nd bedroom.<br>Seepage and peeling off paint and plaster of 2nd bath room. |
| 28 | B 2602 | Crack in exterior surface<br>Crack in wall & dampness in parapet |
| 29 | C 0101 | Crack in wall<br>Crack in Chejja (exterior) |
| 30 | C 0103 | Water proofing required.<br>Plastering peeling off noted in the wall at the entrance. |
| 31 | C 0104 | Crack in Beam<br>Crack in Chejja (exterior) |
| 32 | C 0201 | Floor tiles popping up in Master bedroom<br>Seepage from bathroom/kitchen walls. |
| 33 | C 0202 | Tiles popping up in some places. |
| 34 | C 0203 | Balcony ceiling crack.<br>Kitchen balcony ceiling crack<br>Crack on wall of Master bedroom.<br>Popping up of tiles. |
| 35 | C 0302 | Tiles popping up<br>Seepage in walls |
| 36 | C 0303 | 3 Mtr long crack in window frame in MBR.<br>3 Mtr long crack on Kitchen slab.<br>Crack in columns<br>A developing crack of 4 mtr on the ceiling in dining area.<br>Granite slabs popping up in common area. |
| 37 | C 0304 | 1 Mtr crack observed in 2nd bedroom wall<br>A deep crack on exterior wall of the living room<br>Tiles protruding in the common area and the safety door cannot open. |
| 38 | C 0401 | 2 mtr long crack in guest bedroom and balcony wall.<br>Minor hairline cracks exist in Dining Room and BRs.<br>3 mtr sunshade in kitchen area, drawing room balcony & M bed room balcony.<br>Dampness in wall between MBR and bathroom. |
| 39 | C 0403 | Dampness in wall |

| Ser No | Flat No. | Nature of complaint |
|---|---|---|
| | | Cracks in sunshade |
| 40 | C 0402 | Tiles popping up. |
| 41 | C 0501 | Crack in kitchen wall<br>Crack in slab<br>Crack in chejja (Outer) |
| 42 | C 0503 | Crack on the wall in kitchen below the exhaust fan. |
| 43 | C 0504 | Crack in sunshade<br>Peeling off skirting Tiles. |
| 44 | C 0601 | Appox. 1mtr long crack on drawing room wall.<br>Crack on sunshade.<br>Drawing room balcony wall concrete falling.<br>Tiles popping up & Unable to close doors. |
| 45 | C 0603 | Popping up of tiles. |
| 46 | C 0604 | Entire Ceiling of kitchen balcony concrete falling off. |
| 47 | C 0701 | Spalling in wall at entrance.<br>2 mtr long crack in 1st bedroom (Location)<br>2 mtr long crack above drawing room window.<br>1 mtr long crack on drawing room wall behind entrance door. |
| 48 | C 0802 | Cracks on sunshades at various like kitchen balcony side, middle bedroom balcony side, Master bedroom balcony sunshades, balcony outside living room & kitchen balcony ceiling crack. |
| 49 | C 0803 | All room tiles have crack<br>Balcony sliding doors cannot be locked.<br>1 mtr long crack in ceiling slab. (Location)<br>Dampness in wall |
| 50 | C 0902 | A massive crack in the beam in refuge area. |
| 51 | C 0904 | Seepage of water on bathroom side wall.<br>Crack in wall appox. 10 mtrs long.<br>Crack in external wall |
| 52 | C 1001 | Crack in wall<br>Dampness in wall |
| 53 | C 1002 | Linear cracks for the entire height of the pony wall adjacent to sun shades in the balconies of Bedrooms no 2 & 3. |
| 54 | C 1003 | Separation crack at kitchen beam<br>Crack in sunshade of main balcony. |
| 55 | C 1004 | Cracks in 3x exterior column in front of the kitchen balcony (Southern side)<br>1 Mtr long crack in the sunshade of the drawing room balcony.<br>30 cm long crack in the ceiling of kitchen balcony. |
| 56 | C 1102 | Seepage in MBR wall & Dining hall wall.<br>Crack on ceiling of balcony. |
| 57 | C 1104 | Line crack on the ceiling of 3rd bedroom all along the length of the room.<br>Long crack on the wall of Master bedroom below the window cladding.<br>Kitchen balcony tiles popping up. |
| 58 | C 1201 | Multiple vertical & horizontal cracks in the interior wall of 3 bedrooms and hall.<br>Linear cracks in the sunshade<br>Seepage detected in toilet wall. |

| Ser No | Flat No. | Nature of complaint |
|---|---|---|
| | | Tiles popping up. |
| 59 | C 1204 | Plastering peeling off from all Bathroom walls.<br>Dampness on the ceiling. |
| 60 | C 1301 | Tiles popping up.<br>Patch of staircase fallen off and iron reinforcement found naked and rusty.<br>Un hygienic smell from washroom. |
| 61 | C 1401 | Tiles popping up. |
| 62 | C 1402 | Wall crack in 2nd bedroom<br>Tiles popping up |
| 63 | C 1501 | Crack in slab<br>Dampness in wall |
| 64 | C 1702 | Seepage problem in the Master bedroom attached toilet. |
| 65 | C 1802 | Multiple horizontal and vertical cracks in the Eastern exterior wall of kitchen<br>Linear crack in the West/South exterior walls of the general area between sunshades of flat nos.1801,1901 &1802.<br>Seepage in Master beroom toilet wall towards the bedroom side and interior walls of Refuge area door between C-1801 & C-1802.<br>Tiles cracked in guestroom balcony,kitchen and tiles popping up in various places. |
| 66 | C 1904 | Paint blistering and peeling |
| 67 | C 2102 | Crack in sunshade<br>Crack in tiles<br>Seepage in walls |
| 68 | C 2103 | Wall edges are giving up plaster liberally.<br>Tiles are hollow & popping up. |
| 69 | C 2304 | Separation crack btw wall & RC members. (Location) |
| 70 | C 2604 | 3 Mtr long crack on the left side wall of Master BR.<br>3 Mtr long crack on the left ceiling corner of the master bedroom<br>Cracks around the window frames.<br>Cracks around the door frame facing the dining room.<br>3 Mtr long crack adjacent to the exhaust fan.<br>4 Mtr long crack on the left side ceiling corner of 2nd bed room.<br>4 mtr long crack on right side wall.<br>2 mtr long crack of the lft sidewall of Dining hall.<br>Crack around the door frame of 3rd bedroom facing the hall. |

# MEMORANDUM OF UNDERSTANDING (MOU) COPY-WITH AMENDMENTS

**MEMORANDUM OF UNDERSTANDING BETWEEN**
**ARMY WELFARE HOUSING ORGANISATION**
**AND**
**M/S BUREAU VERITAS (INDIA) PVT LTD**
**DATED 27 DEC 22**
**FOR**
**STRUCTURAL ASSESSMENT AND CONSULTANCY FOR ANALYSIS, NDT , RETROFITTING SCHEME FOR TOWER B & C ONLY AND PREPARATION OF FINAL BOQ FOR ALL DESTRESSES (BOTH STRCUTURAL AND NON-STRUCTURAL IN TOWER A, B & C), AT AWHO PROJECT SSI, KOCHI**

1. M/S Bureau Veritas (India) Pvt Ltd, Bangalore hereinafter referred to as BVIL represented by, Managing Director, BVIL and Army Welfare Housing Organisation hereinafter referred to as 'AWHO' represented by the Managing Director, AWHO, New Delhi, and hereinafter jointly referred to as participants.

2. Please refer to under mentioned reports, work order and proposals :-

(a) AWHO **Work Order** issued for proof checking, retrofitting scheme and preparation of BOQ for retrofitting of SSI, AWHO, Kochi forwarded vide AWHO letter No. dated No B/03029/ SSI/ Job work/ Thurs/CHN/AWHO no dated 25 Aug 22.

(b) Based on the above work order (Refer Para 2(a)), the **Final Analysis Report** of Tower B & C, which was received on 13 Oct 22.

(c) BVIL's Site Visit Report on 13 Oct 22 forwarded vide this office letter No B/03029/ SSI/ Mon/CHN/AWHO dated 17 Oct 2022.

(d) BVIL's Site Visit Report on 13 Oct 22 forwarded by BVIL vide their email dated 21 Oct 22.

(e) Ref your e- Mail dated 25 Oct 22 vide which your Technical Commercial Proposal **No IND.B.7.2022.300 DR-R3 4480974 dt 25 Oct 22** was received by this office.

3. M/S Bureau Veritas (India) Pvt Ltd (BVIL) have accepted the proposal to take up the structural assessment and consultancy for analysis of **AWHO PROJECT SSI, KOCHI** to include structural analysis of Tower B & C and suggest the retrofitting scheme at Chanderkunj Army Towers, Vytilla, Ernakulam on the payment basis.

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The following understanding has reached between the two parties :-

4. The scope of structural consultancy entrusted to BVIL shall involve as discussed in following Paras.

5. **Present Condition Assessment**. The focus here will be to gather the information available about the project, where BVIL shall need inputs like architectural plans of the buildings, good for construction structural drawings of the buildings, soil investigation reports, pile load test report etc. The main objectives here will be to identify the points of distress, carryout non-destructive testing by the Bureau Veritas, and to quantify the extent of distress. The data obtained from the non-destructive testing conducted will be used for finding the extent of distress. The distress shall also to be classified as structural distress and non-structural distress, based upon the way of occurrence. The findings generated because of these assessments shall be documented as a report, which forms the basis of further analysis. Most of the documents / drawing have already been handed over to BVIL along with structural model prepared by Govt Engg college which can be made use of as required by BVIL. BVIL will prepare the new models with applicable code during construction. BVIL suggested to check the towers B & C with IS16700 and had detailed discussion on the same; since IS code 16700 was released in 2017 and IS 16700 will not be considered as per the directions of AWHO.

6. **Design Basis Report.** The design basis report is a document which depicts all details pertaining to the assumptions being adopted in the structural analysis process of the building. it will also clearly define the magnitude of loads being considered, type of structural analysis being performed, methodology of numerical solution used and design philosophy being adopted for the building. This document shall be finalized by BVIL.

7. **Structural Analysis and Design Report**. The structural analysis and design report is a set of documents which will define the steps being adopted in the structural analysis and design process of different structural components of the building like foundations, columns, beams, slabs etc. The present-day structural capacity of the building will be mapped against the structural demand to quantify the gap between both. The extent of retrofit as well as the method of retrofit to be decided based on it. This report forms the tangible base for the development of detailed retrofitting structural drawings. The proposed retrofitting in any way do not plan to alter the geometry and configuration of the building and the structural adequacy based on as built condition will only be addressed. There may be changes in sizes of existing structural elements based on design capacity requirement.

8. **Retrofitting Structural Drawing.** The retrofitting structural drawings shows the minute details pertaining to each structural component of the building like reinforcements to be adopted, their layout, spacing. grade of reinforcement, grade of concrete etc. The dimensions of RCC structural members like columns, beams and shear-walls will be taken from a site survey and manual inspection. The reinforcement details like bar diameter, spacing etc. will be taken from the latest structural drawing issued for construction. The bar



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diameter and spacing will be randomly checked by using a rebar scanner. The foundation details are taken from the as built drawings available, as actual dimensions and reinforcement layouts are out of reach of our investigations. The quantity survey team of Bureau Veritas will finalize the bill of quantities (BOQ) only after taking inputs from the design report. The **retrofitting structural drawings** shall be part of this contract agreement and shall be provided along with structural analysis & design report.

9. **Site Visits and Site Inspection Report**. Visit to the site for NDT tests, inspection of the progress of the tests and check the compliance of structural drawings shall be done as per the requirement of BVIL. The expense/ cost of such visits will be included in your proposal. A report on the inspection carried out shall be prepared and sent to AWHO after such visits.

10. The RWA and AWHO will extend necessary co-operation and assistance to BVIL during the said work, furnish the required documents/ drawings to BVIL as required and assist BVIL to inspect the various buildings under the work. The following soft copy and hardcopies will be provided by AWHO for Tower B & C, if not already provided earlier :-

(a) Survey Report of the area

(b) Soil Test Report

(c) Final Architectural Drawings

(d) Final Structural Framing Drawings / GA drawings

(e) Structural Drawings – Reinforcement Drawings of Structural components

(i) Pile layout and details

(ii) Pile cap details

(iii) Plinth Beam Details

(iv) Column & Shear Walls

(v) Slabs and Beams Reinforcement details all floors

(vi) Staircase Details

## SCOPE OF WORK

11. In view of the above, it is proposed to carry out a detailed stability evaluation study as illustrated in different parts in the succeeding paras:-

12. **Part A : Visual Inspection**

(a) Visual inspection will be done to assess the condition of the structure. All the structural elements above the basement level, at least 70% of the elements to be inspected based on site situation.

(b) Identify any signs of structural distress and deformation and any signs of material deterioration.

(c) Preparation of visual inspection report along with observation, photographs and propose the NDT plan for of distressed members for further evaluation.

13. **Part B : NDT on RC Members/ Concrete**. The RWA and AWHO will extend necessary co-operation and assist BVIL to inspect the various buildings under the work. Necessary coordination will be done by the Project Director of AWHO at Kochi with RWA. The cost of labour, material i.e. ladders, tools, scaffolding etc should be separated from your proposal. ( Ref. clause 22d)

(a) Dimensional verification of the existing structural members with existing as-built drawings for theoretical verification.

(b) Carrying out Ultrasonic Pulse Velocity Test on distressed and all accessible RC members at all floors for assessment of quality/in-situ strength of concrete as per IS 516 Part 5/Sec1:2018.

(c) Carry out Rebound Hammer Test on distressed and all accessible RC members at all floors for assessment of surface hardness and strength of concrete as per IS 516 Part 5/Sec 4:2020.

(d) Carry out Cover Meter Test on distressed and all accessible RC members at all floors for detecting disposition of re-bars and thickness of cover concrete provided as IS 1881Part 204:1988.

(e) Carrying out Half-Cell Potential measurement test on distressed and identified RC members to assess the extent of corrosion & mapping of corrosion as per IS 516 Part 5/Sec-2:2021.

(f) Carry out carbonation test on randomly identified RC members to assess the depth of carbonation in cover concrete as per IS 516 Part 5/Sec-3:2021.

(g) Carrying out chemical analysis of concrete for assessment of chloride content as per IS: 14959 part II-2001, Sulphate Content as per BS: 1881 (Part 124) – 2015 and pH value as per IS: 2720 (Part 26): 1987 (RA 2021) of concrete through samples collected at site.

(h) Carrying out electrical resistivity test (resipod test) on RC members to estimate the likelihood of corrosion NDT on RC structural



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elements will be done with random sampling covering columns, shear walls, beams, and slabs. The structural members NDT location shall be decided based on visual inspections.

14. **Part C : Theoretical Verification And Design Check**. Theoretical Evaluation and Structural Assessment for Tower B & C only. **Structural Assessment of Tower A is not included** in the scope of work, however, non-structural assessment of any distresses to be checked and included in the final BOQ for Tower A, B & C. The evaluation and assessment will be carried as :-

(a) Carryout three dimensional analysis of the structural system of the structure using appropriate analysis and software- ETABS.

(b) Carry out theoretical analysis & design check of the members for critical load combinations present loading & compliance with prevailing seismic conditions.

(c) Evaluation of Foundation.

(d) Evaluation of Columns & Shear Walls-All Floors.

(e) Evaluation of Slabs of Floors (Random sampling).

(f) Evaluation of Beams for Floors (Random sampling).

(g) Evaluation of Staircase.

15. **Reference Codes & Standards**. It is hereby informed that the said project was constructed and completed in the year 2018, thus the design of the building shall comply with prevailing IS codes during construction of the building. The IS codes to be followed in Structural Assessment of Tower B & Tower C are as under:-

(a) IS 456: 2000 – Code of Practice for Plain & Reinforced Concrete.

(b) IS 875: Part 1: 1987 – Code of practice for design loads (Other than Earthquake)for buildings & Structures.

(c) IS 875: Part 2: 1987 – Code of practice for design loads (Other than Earthquake)for buildings & Structures.

(d) IS 875: Part 3: 2015 – Code of practice for design loads (Other than Earthquake)for buildings & Structures.

(e) IS 1893: Part 1– 2002 Criteria for Earthquake Resistant Design of Structures.

(f) IS 13920: 1993 – Code of Practice for Ductile Design & Detailing of Reinforced Concrete Structures Subjected to Seismic Forces



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16. **Part D : Restoration Measures.**

(a) Suggest appropriate restoration measures for repairs and rehabilitation works based on NDT results and theoretical analysis and design check.

(b) Methodology, scheme and sketches for repairs & rehabilitation.

(c) Suggest material Specifications for the repairs and rehabilitation works.

17. **Part E : Preparation of Tentative Cost Estimate (BOQ).** Based on the proposed repairs and restoration measures, preparation of bill of quantities for material and labour component for proposed repair/ strengthening work. The BOQ may vary as per site condition and should be as per prevailing market rates. The final BOQ should include all quantities required for structural repairs in Tower B & C. It should also include the non-structural repairs that are required in Towers B & C as witnessed and highlighted in the report dated Apr 2021 and BOQ 1.

18. **Part F : Suggestion of Technically Qualified Companies.** Based on the proposed repairs and restoration measures and BOQ, BVIL will suggest three names of reputed and technically qualified firms/ companies that have prior experience of carrying such restoration works and will carry out the suggested restoration scheme as per SOP. BVIL will assist AWHO in shortlisting and selection of a firm to carry out the suggested restoration work.

19. **Part G: Monitoring/ Supervision of Restoration Works.** The supervision of the Repairs & Rehabilitation works will be done by a technically competent team of engineer of BVIL. The team will monitor the progress of work as per SOP submitted for the remedial measure by BVIL. A separate proposal will be forwarded by BVIL for supervision work along with details of the team that they suggest to employ, on payment basis.

20. **List of Deliverables**: Bureau Veritas (India) Pvt. Ltd. will submit a report wrt the above scope, which consists of:

(a) Physical observations and present condition Assessment Report.

(b) NDT evaluation of entire Tower B & C and test results. NDT test schedule will be prepared and submitted by BVIL within 15 days from the date of receipt of the work order.

(c) Theoretical Analysis & Design of structure through ETAB models prepared as per all provisional IS codes. ETAB models prepared will also be provided to AWHO in soft copy.

(d) Design Basis Report.



BUREAU VERITAS (INDIA) PRIVATE LIMITED BANGALORE

(e) Structural Analysis and Design Reports.

(f) Method statement for different retrofitting techniques to be adopted along with strengthening measures and sequencing of the retrofitting work.

(g) Preparation of the Final Bill of Quantities (BoQ 2) based on the methodology recommended. Also, to include additional quantities of nonstructural distresses in Tower A, B & C as suggested by BVIL in the BoQ 1 (Old BoQ submitted in Apr 21).

(h) Suggest names of three competent agencies who have executed such retrofitting work earlier.

(i) Distress Mapping Sketches.

(j) Strengthening Measures Sketches and Specifications.

(k) Detailed retrofitting structural drawings, three numbers of hard copy in A3 size drawing sheet and soft copy in .pdf file format..

21. **Professional Charges**. The professional charges for the services offered will be Rs 40,56,000/- plus 18 % GST. Terms of payment of the professional charges shall be as under :-

(a) 30% against Work Order
(b) 30% against the completion of field investigation and NDT testing.
(c) 30% against Draft Report Submission.
(d) 10% against Final Report Submission.

22. **Timeline**. The period of Structural assessment would be for a period of 04 months from the date of signing MoU. **Deliverables as mentioned above will be completed and provided to AWHO within 120 days from the** date of receipt of work order and the building will be restored to its residual life once the retrofitting work is completed.

23. **General Conditions**.

(a) AWHO shall have the right to request BVIL in writing to make any addition to BVILs scope of services. BVIL shall review such written request on mutually agreed basis.

(b) If AWHO decides to terminate this MoU or decides to drop the proposal after substantial preliminary work has been done by BVIL on the project, AWHO will pay expenditure/compensation to BVIL based on progress of the work.

(c) If BVIL decides to terminate this MoU, AWHO reserves the right to take up the remaining work in any manner it deems fit without waiting for settlements (if any) with BVIL at the risk and cost of the BVIL.

(d) As agreed, an additional proposal will be forwarded by BVIL for any additional civil work that is required on site while carrying out NDT tests. The **additional proposal for undermentioned work** will be forwarded within 30 days from date of receipt of work order:-

(i) For arranging the unskilled labours, ladders, ropes, cranes, scaffolding etc required to facilitate the testing (NDTs) and inspection by BVIL.

(ii) For the temporary patch work and repairs required after NDT tests is carried by BVIL.

(iii) Electricity and Water as required will be provided by RWA on payment basis and same should be included in the proposed cost.

(e) If any dispute/difference arises between the parties that would be settled amicably by the parties through mutual discussions failing which any party can invoke arbitration to settle the disputes through DIAC New Delhi only.

For and on behalf of AWHO

27 Dec 22

For and on behalf of BVIL

BUREAU VERITAS (INDIA) PRIVATE LIMITED BANGALORE

**SPEED POST**

E mail: pd_kochi_ssi@awhosena.in

Army Welfare Housing Organisation
C/o Prasanna Vihar, Marine Drive
Opp. High Court, Kochi – 682 031

B/03029/SSI/ Mon /CHN/AWHO

20 Feb 2023

M/s Bureau Veritas (India) Pvt Ltd
Regional Office
#1030, 13th Cross, Banashankari
2nd stage, Atthimabbe road,
Bangalore -560070

CATAOA,
SSI, Vytilla, Kochi

**AMENDMENTS TO MoU**
**CARRYING OUT OF STRUCTURAL ASSESSMENT AND CONSULTANCY FOR ANALYSIS, NDT, RETROFITTING SCHEME AT AWHO PROJECT, SSI VYTTILA, KOCHI**

1. PI refer :-

(a) This office letter No: B/03029/SSI/Job Work/Fri /CHN/AWHO dt 30 Dec 22 and MoU signed on 27 Dec 22. The under mentioned aments may please carried out.

(b) First Bi-weekly meeting held on 02 Feb 23 and its MOM forwarded by this office letter No. B/03029/SSI/Sat/CHN/AWHO dated 04 Feb 23.

(c) HQ AWHO lette No. B/03020/SSI/Kochi/Wed/AWHO dt 01 Feb 23.

(d) Second Bi-weekly meeting held on 16 Feb 23 and its MOM forwarded by this office letter No. B/03029/SSI/Sat/CHN/AWHO dated 18 Feb 23.

2. Certain Amendments to the Original MoU as discussed and agreed are as under mentioned:-

(a) **For- Para -17 Part E : Preparation of Tentative Cost Estimate (BOQ).** Based on the proposed repairs and restoration measures, preparation of bill of quantities for material and labour component for proposed repair/ Strengthening work. The BOQ may very as per site condition and should be as per prevailing market rates. The final BOQ should include all quantities required for structural repairs in Tower B & C. It should also include the nonstructural repairs that are

required in Towers B & C as witnessed and highlighted in the report dated Apr 2021 and BOQ.

**Read- Para 17 Part E: Preparation of Tentative Cost Estimate (BOQ).** Based on the proposed repairs and restoration measures, preparation of bill of quantities for material and labour component for proposed repair/ strengthening work. The BOQ may very as per site condition and should be as per prevailing market rates. The final BOQ should include all quantities required for structural repairs in Tower B&C. It should also include all the nonstructural repairs in ***Towers A, B, C and Club House*** as witnessed and highlighted in the report dated Apr 2021 and BOQ.

(b) **For- Para -22 Timeline.** The period of structural assessment would be for a period of 04 Months from the date of signing MoU. Deliverable as mentioned above will be completed and provided to AWHO within 120 days from the date of receipt of work order and the building will be restored to its residual life once the retrofitting work is completed.

**Read - Para -22 Timeline**. The period of structural assessment would be for a period of 04 Months from the date of signing of ***work order***. Deliverable as mentioned above will be completed and provided to AWHO within 120 days from the date of receipt of work order and the building will be restored to its residual life once the retrofitting work is completed.

(c) **Add - *Para 20 (L)*. *Distress mapping of basement retaining wall will be done by BVIL, by carrying out thermography scanning (report of thermography carried out by AWHO in Dec 22 will be shared with BVIL) and include the repairs of retaining wall in the final BOQ 2.***

**(d)** As per Para 6 of MoM discussed on 16 Feb 23 referred at Para 1 (d) above.

**Add - Para 22 (a). The Report and BOQ for Towers B & C and the Retaining Wall will be submitted as on 30 Apr 23 (120 days after signing the Work Order) and the Report and BOQ of Tower A and Club House will be submitted in 21 days post 30 Apr 23 i.e. by 21 May 23. No delay will accepted in submission of the report.**

3. The above changes have been discussed and duly approved by Mr Ravishankar and during the Bi-Weekly Meetings on 02 Feb 23 & 16 Feb 23 with rep pf RWA, AWHO and BVIL. The above changes are agreed to without any additional cost in the present MoU.

For and on behalf of AWHO
PD, Kochi
20 Feb 23

For and on behalf of BVIL

**Copy To**

Dy MD (Tech)
Army Welfare Housing Organization
Kashmiri House, South Hutments
Rajaji Marg, New Delhi -110011

Director (Plg)
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For and on behalf of AWHO
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Mar 2023

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**AMENDMENTS TO MoU**
**CARRYING OUT OF STRUCTURAL ASSESSMENT AND CONSULTANCY**
**FOR ANALYSIS, NDT, RETROFITTING SCHEME**
**AT AWHO PROJECT, SSI VYTTILA, KOCHI**

1 Pl refer to this office letter No: B/03029/SSI/Mon/CHN/AWHO dt 20 Feb 23.

2. Four copies of Amendment of MoU Carrying out of structural assessment and consultancy for analysis, NDT, Retrofitting scheme at SSI Vyttila Kochi is forward herewith for your signature please. It is requested to please get the amendments signed by authorized signatory is also Write down the details of the signatory (by pen) for our records.

3. Once signed the original it is requested to sent all 4 copies to this office for further distribution

(Sidhartha Singhal)
Lt Col
Project Director

**Copy To**

Dy MD (Tech)
Army Welfare Housing Organization
Kashmiri House, South Hutments
Rajaji Marg, New Delhi -110011

Director (Plg)
Army Welfare Housing Organization
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CATAOA, SSI Vyttila

For info please

# ALL REVIEW MEETING'S MINUTES OF MEETING(MOM)

E mail: pd_kochi_ssl@awhosena.in

Army Welfare Housing Organisation
C/o Prasanna Vihar, Marine Drive
Opp. High Court, Kochi – 682031

B/03029/SSI/Sat/CHN/AWHO

04 Feb 2023

M/s Bureau Veritas (India) Pvt Ltd
Regional Office
#1030, 13th Cross, Banashankari
2nd stage, Athimabbe Road,
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**BIWEEKLY REVIEW MTG WITH BUREAU VERITAS INDIA LIMITED (BVIL)**

1. A Biweekly Review mtg was held with reps of RWA, BVIL was held between 1100 to 1200h on 02 Feb 2023.The various points discussed during the mtg and various discussions and decisions taken are given in succeeding paragraphs. The same was attended by the following pers: -

| Ser | Name | Designation |
|---|---|---|
| (a) | Dr Shantharaju, | Technical Adviser, Design Review (BVIL) |
| (b) | Mr. Ravishankar | Sr. Manager, NDT (South),BVIL |
| (c) | Mr. Avinash | Technical Manager, NDT (Pan India) BVIL |
| (d) | Mr. Vinoth Mahendran | Senior Design Engr (BVIL) |
| (e) | Mr. Umar Sharif | Design Engr (BVIL) |
| (f) | Mr. Manjunath BS | Project Coordinator (BVIL) |
| (g) | Brig DN Bhatt | Dy MD, HQ AWHO |
| (h) | Lt Col S Singhal | Project Director, AWHO Kochi |
| (i) | Rear Admiral P Ashokan (Retd | President, RWA |
| (j) | Col MN Nair (Retd) | Exe Member, RWA |
| (k) | Col MS Yohannan (Retd) | Exe Member, RWA |
| (l) | Col NN Pillai (Retd) | Exe Member, RWA |
| (m) | Col PV Varghese (Retd) | Exe Member, RWA |

**Discussions and Decisions**

2. **Progress and Future Timeline**. Mr Manjunath (BVIL) stated that NDT has been completed up to 4th Floors of Towers B and C commencing from the basement. Dr Shantharaju (BVIL) directed that NDT should be completed by 22 Feb 23 and same was confirmed by Tech Team of BVIL.

3. **Progress on ETAB Model by BVIL (B'lore)**. Dr Shantharaju stated that the ETABS modelling including foundation and pile cap is being analysed as per the original drawings. NDT results would be fed into this model subsequently. He directed Mr Manjunath to inspected four random foundations (two each in Towers B and C) with cap and pile, so that the actual values are fed into the model. After the test the foundations

will be immediately refilled and compacted and restored to original. Mr Manjunath said that this will take about a week and all safety precautions will be observed.

4. **Documentations and Drawings.** PD stated that all documents and drawings have been submitted in PDF format to Dr Shantharaju and hard copies to Mr Manjunath, including soil investigations, pile cap and foundation reports. Dr Shantharaju and Mr Manjunath confirmed the same. However Dr Shantharaju added that there are thousands of drawings and there may be requirement for an odd one as the work progresses. PD stated that the same would be made available in the shortest time frame.

5. **Sharing Report of Chief Engineer (Kochi Area).** President requested Dy MD and PD to share the report of CE (Kochi Zone) during the visit on 03 July. Dy MD stated that all reports held with AWHO will be shared.

6. **Drone Survey**. Mr Revishankar stated that the drone operator will get in touch with PD/RWA by 05 Feb 23 and carry out a demo by 05 Feb 23.

7. **Retaining Wall**. It was confirmed by Dy MD and BVIL that Retaining Wall will now be done under the Project Management Consultancy of BVIL as requested by the RWA. The structural analysis/ thermography tests will be done along with the ongoing tests as part of the existing MoU, and repairs thereof will be included in the BOQ. President RWA wanted a clarification on the repairs strategy and guarantee. He stated that the BVIL report of May 2021 mentions repairs from positive side after two years if required. But during the visit on 13 Oct 22, Dr Shantharaju mentioned that negative side repairs are adequate and warranty of ten years can be given. Dr Shantharaju confirmed that repairs will be done only from the negative side. To reduce the pressure of water two wells will be dug with depth going down below the base of the retaining wall. Water will have to be pumped out from time to time to reduce the pressure on the wall. The repairs scheme would be included in the BVIL final report. The contractor will work under the supervision of BVIL as per the scheme recommended by BVIL and would give a guarantee of ten years which will be confirmed by BVIL.

8. **Estimation of Residual Life**. In response to the query of President RWA, Dr Shantharaju mentioned that the Report would have a separate chapter on residual life. The chapter will mention the residual life as on date with the results of the NDT incorporated. The report will also mention the residual life after the restoration is done. He added that normally buildings are designed for fifty years and the restoration work will ensure that the building will last for the period of its residual life as on the date of completion of repairs. The same shall be certified in the report.

9. **Running of Pipelines Across the Beams**. Mr Manjunath confirmed it has been all beams where pipelines are running across have been tested and core sample duly extracted and will be tested.

10. **NDT of Lift Wells**. Would be undertaken by BVIL.

11. **Other Delinked Works**. President RWA requested that the two other works delinked from the overall restoration, i.e. marble flooring and lift cladding should be done as a part of the overall restoration. However, he recommended that lift cladding tiles which are on the verge of falling (and which could pose a risk to safety) should be done forthwith. President RWA stated that he would suggest a contractor who had previously carried out cladding repairs on Tower C, 5th floor. Mr Manjunath stated that he is marking

such tiles and he would give the number by 05 Feb 23. These cladding will be undertaken for repair forthwith by AWHO and balance lift claddings will be included in the final BOQ by BVIL.

12. **Third Party Vetting**. Dr Shantharaju stated that he is open to vetting of his Report by anybody if needed.

13. **Future Reviews**. PD recommended that there should be a similar review after two weeks around. on 16 Feb 23, followed by another one on 24 Feb 23 post completion of NDT. This was concurred by BVIL.

14. For your necessary action please.

**Sd-xxxxxxxxxx**
(Sidhartha Singhal)
Lt Col
Project Director

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B/03029/SSI/Sat/CHN/AWHO

Feb 2023

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**BIWEEKLY REVIEW MTG WITH BUREAU VERITAS INDIA LIMITED (BVIL)**

1. Second Biweekly Review mtg was held with reps of RWA, BVIL was held between 1100 to 1200h on 16 Feb 2023.The various points discussed during the mtg and various discussions and decisions taken are given in succeeding paragraphs. The same was attended by the following pers: -

| Ser | Name | Designation |
|---|---|---|
| (a) | Dr Shantharaju, | Technical Adviser, Design Review, (BVIL) |
| (b) | Mr. Ravishankar | Sr. Manager, NDT (South), BVIL |
| (c) | Mr. Avinash | Technical Manager, NDT (Pan India), BVIL |
| (d) | Mr. Vinoth Mahendran | Senior Design Engr, (BVIL) |
| (e) | Mr. Umar Sharif | Design Engr, (BVIL) |
| (f) | Mr. Manjunath BS | Project Coordinator, (BVIL) |
| (g) | Mr. Vijay HV | Manager, NDT & RR, BVIL |
| (h) | Mr. Girish R | Manager, NDT (South), BVIL |
| (i) | Brig DN Bhatt | Dy MD, HQ AWHO |
| (j) | Lt Col S Singhal | Project Director, AWHO Kochi |
| (k) | Rear Admiral P Ashokan (Retd) | President, RWA |
| (l) | Col MN Nair (Retd) | Exe Member, RWA |
| (m) | Col MS Yohannan (Retd) | Exe Member, RWA |
| (n) | Col NN Pillai (Retd) | Exe Member, RWA |
| (o) | Col PV Varghese (Retd) | Exe Member, RWA |

**Discussions and Decisions**

2. **Progress and Future Timeline**. Mr Manjunath (BVIL) stated that the tests of both Towers B and C have been completed except 16 flats (RWA to make the flats available). NDT and thermography of the retaining wall is in progress. Distress mapping of Tower A will be undertaken wef 17 Feb 23. He stated that they are on track to complete the tests by 23 Feb 23 as per schedule. Dr Shantharaju requested the President to make the 16 flats available else the defects in these flats would not be attended to by the inspection team. Also, since data about structural members of these

flats would not be available assumptions would have to be made. Also, No repairs in these flats will not be undertaken in the future.

3. **UPVT Readings**. Mr Manjunath stated that UPVT readings in the common areas and flats are showing some errors, due to thickness of the exterior plaster. Dr Shantharaju informed that if the plaster thickness is greater than 11-12 mm, it can lead to erroneous UPVT readings, thus he directed to scrape the plaster to the mother concrete and readings retaken. Mr Manjunath stated that he would forward the list of flats and areas to President RWA. Dr Shantharaju sought the assistance of the President RWA and the latter concurred. It was also decided that any area inside flat where chipping of plaster is carried out the same will be plastered by BVIL and repainted to best possible matching paint on request of the owner. The common areas will not be painted and will be duly marked by BVIL.

4. **Progress on ETAB Model by BVIL (B'lore)**. Dr Shantharaju stated that the evaluation of the foundation and pile cap is under progress and would take another ten odd days. The plan to inspect the foundation is dropped in view of the high water table, which was encounter during the test bore on 08 Feb 23. Now since physical inspection and testing of pile cap and foundation is not possible, the evaluation of the foundation would be based on the assumptions. Dr Shatharaju explained the assumption that will be made by them. He stated that the foundation and pile cap will be assumed to be as per GFC drawings and the capacity of the foundation will be taken at 80 % of the rated capacity and the same would be stated in the report. At this point President RWA stated that as per the BVIL Report dated 13 Oct 22, Tower C was rotated by $90^0$ from the GFC drawings and he wanted to know the impact of the same on the analysis. Dy MD AWHO clarified that while it is true that the orientation was changed from initial drawings which were approved by IISc, Bangalore but the building is finally built as per the amended GFC drawing though the same have not been approved by IISc, Bangalore. Dr Shantharaju stated this this is not an issue.

5. **Documentations and Drawings.** Dr Shantharaju said that there is no additional requirement at this stage. PD stated that he would forward the drawings of Tower A and Club House by 18 Feb 23.

6. **Extension of Timeline View Inclusion of Inspection of Tower A and Club House.** BVIL stated that in view of RWA's request to include the inspection of Tower A, Retaining Wall and Club House the date of submission of the Report and BOQ will have to be extended by 20 days. This was objected to by President RWA but BVIL insisted that the same is required in view of the enhanced scope of work. Dy MD directed the that **the Report and BOQ for Towers B & C and the Retaining Wall to be submitted on 30 Apr 23 (120 days after signing the Work Order) and the Report and BOQ of Tower A and Club House can be submitted in in 21 days post 30 Apr 23 i.e. by 21 May 23.**

7. **Amendment of MoU**. PD stated that he had forwarded a draft amendment and confirmation of the same was awaited from BVIL. BVIL stated that the same would be forwarded by would be forwarded by 18 Feb 23.

8. **Future Reviews**. PD recommended that there should be a similar review before the team leaves around 24/ 25 Feb 23. President RWA stated that this was very close to the GBM (on 26 Feb) and a suitable date would be intimated.

9. For your necessary action please.

Sdxxxxxxx
(Sidhartha Singhal)
Lt Col
Project Director

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B/03029/SSI/Fri/CHN/AWHO

17 Mar 2023

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**THIRD REVIEW MTG WITH BUREAU VERITAS INDIA LIMITED (BVIL)**

1. Third Review mtg was held with reps of RWA, BVIL was held between 1100 to 1200h on 15 Mar 23. The various points discussed during the mtg and various discussions and decisions taken are given in succeeding paragraphs. The same was attended by the following pers: -

| Ser | Name | Designation |
|---|---|---|
| (a) | Dr Shantharaju, | Technical Adviser, Design Review, (BVIL) |
| (b) | Mr. Ravishankar | Sr. Manager, NDT (South), BVIL |
| (c) | Mr. Avinash | Technical Manager, NDT (Pan India), BVIL |
| (d) | Mr. Vinoth Mahendran | Senior Design Engr, (BVIL) |
| (e) | Mr. Umar Sharif | Design Engr, (BVIL) |
| (f) | Mr. Manjunath BS | Project Coordinator, (BVIL) |
| (g) | Mr. Vijay HV | Manager, NDT & RR, BVIL |
| (h) | Mr. Girish R | Manager, NDT (South), BVIL |
| (j) | Brig DN Bhatt | Dy MD, HQ AWHO |
| (j) | Lt Col S Singhal | Project Director, AWHO Kochi |
| (k) | Rear Admiral P Ashokan (Retd) | President, RWA |
| (l) | Col MN Nair (Retd) | Exe Member, RWA |
| (m) | Col MS Yohannan (Retd) | Exe Member, RWA |
| (n) | Col NN Pillai (Retd) | Exe Member, RWA |
| (o) | Col PV Varghese (Retd) | Exe Member, RWA |

**Discussions and Decisions**

3. **Update on Backend Work at BVIL Bengaluru**. Mr Shantharaju stated that theoretical evaluation of the foundation and pile cap would be completed by this weekend i.e. 20 March 23. However, as pervious review meeting on 18 Feb 23 the same evaluation was to be completed in ten days from then i.e. end Feb 23, however there is

delay and clearly progress is not as per plan. Request to please expedite the progress for timely submission of the report

4. **Overall Timeline.** PD AWHO wanted to know if there is any change in the overall timelines. Dr Shantharaju stated that the chemical analysis of Tower B is going slightly slow and therefore his plan is to send the draft report on Tower C, Tower A, Club House and Retaining Wall on 30 Apr and then the draft report on Tower B after three weeks on 21 May. Mr Avinash added that the chemical analysis of Tower B is going at a slow pace and this being important we do not want to dilute the same. To corroborate the correctness of tests they are sending two samples BVIL lab in Mumbai too, especially for testing of chlorine content. PD AWHO sought clarification from BVIL whether the BOQ would be submitted along with the report. Dr Shantharaju mentioned that after the report is perused by AWHO and RWA the final BOQ will be prepared based on the comments. Dy MD Tech, HQ AWHO stated that the RWA/ AWHO does not have the domain knowledge to comment on the report and therefore BVIL should not wait for comments and submit the final report including the BOQ by the agrees dates i.e. 30 Apr 23 along with the BOQ. President RWA reiterated that the deliverables of the MoU by the due date were the Report and BOQ and hence there is no reason another 15 days should be sought for the BOQ. Dy MD Tech stated that AWHO is keen that the rectification work start at the earliest in view of deteriorating structural state of the building and with that in view everyday counts. He suggested that there is still time to replan and BVIL being a professional organisation must deliver the products (Report and BOQ) within agreed timelines. Dr Shantharaju said that they would discuss it internally to achieve the best.

5. **Identification of Restoration Agency.** President RWA suggested that notwithstanding the timeline discussed above BVIL must recommend the three agencies so that the tendering process does not get delayed. Dr Ravishankar stated that while the three agencies can be recommended, any discussion can start only after the scope of work is clear which can happen only after the final BOQ is prepared. President RWA commented that we are in the same state as we were in Oct 2022, when we expected the report and BOQ and BVIL submitted only the report. Dr Shantharaju, reiterated that the case this time is different and all that BVIL is asking for additional 15 days to make the BOQ. He added that unlike new construction, preparation of BOQ is a very deliberate process for any restoration work as its entails lot of details and analysis. Dy MD Tech reiterated the need of hour is tha BVIL should meet the agreed timelines and and BVIL being a professional organisation will deliver the products (Report and BOQ) on time.

6. **Submission of Distress Survey Reports in AutoCAD.** President RWA stated that the distress survey reports of flats and common areas as recorded during the inspection is there in possession of the RWA. He requested BVIL for the reports replicated in AutoCAD, to which Dr Shantharaju stated that the same will be will part of the report and the soft copy will also be provided separately. For better clarity and comprehension, he suggested that these be printed out in A2 format and archived.

7. **Update wrt Col Ciby's Email.** PD AWHO brought out Col Ciby has sent a mail and photograph and sought confirmation from Mr Manjunath whether these have been included in the survey report and the latter agreed in the affirmative. He added that after Col Ciby had reported corrosion of underlying bars in the flooring of C 0204 where refilling was being done, the same was inspected after permission from RWA and the distress was recorded. Mr Ravishankar requested the President RWA to inform all

owners that anyone in possession of any data should submit the same to BVIL. Photographs should be properly annotated with date and location, so that the same can be replicated on the distress map. President RWA stated that he has got a list of defects reported by owners prior to the inspection and that he would be sending the same and these too should be included in the distress map, so that nothing is missed. Dr Shantharaju stated that three flats in Tower B and C and 22 flats in Tower A were not inspected as the same were not provided by the owners. Repairs will not be undertaken in these flats. Also, it will be mentioned in the report that 'for the sake of making structural analysis, it will be assumed that the distress in these flats follows the same pattern as the inspected flats.'

8. **Completion of Post NDT Patchwork Repairs**. PD AWHO sought conformation from President RWA whether this has been done and the latter replied in the affirmative.

9. **Amendment of MoU**. PD stated that he has forwarded the final amendment of the MOU to BVIL for signatures and the same is awaited from BVIL duly signed. BVIL stated that the same would be forwarded at the earliest.

10. **Future Reviews**. PD recommended that there next review meeting will be done after 14 days i.e. by end Mar 23 ( 28/ 29 Mar 23).

11. Dy MD Tech, AWHO concluded the meeting stating that AWHO has to answer its Higher Management on the progress of work and he requested BVIL to pool in all their resources and commitment to ensure that the agreed timelines are met which a prestigious organisation like BVIL is definitely capable of.

12. For your necessary action please.

Sdxxxxxxxxxxxx
(Sidhartha Singhal)
Lt Col
Project Director

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08 Apr 2023

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**FOURTH REVIEW MTG WITH BUREAU VERITAS INDIA LIMITED (BVIL)**

1. Fourth Review mtg was held with reps of RWA, BVIL was held between **1100h to 1200h on 03 Apr 23**. The various points discussed during the mtg and various discussions and decisions taken are given in succeeding paragraphs. The same was attended by the following pers: -

| Ser | Name | Designation |
|---|---|---|
| (a) | Dr Shantharaju, | Technical Adviser, Design Review, (BVIL) |
| (b) | Mr. Ravishankar | Sr. Manager, NDT (South), BVIL |
| (c) | Mr. Avinash | Technical Manager, NDT (Pan India), BVIL |
| (d) | Mr. Vinoth Mahendran | Senior Design Engr, (BVIL) |
| (e) | Mr. Umar Sharif | Design Engr, (BVIL) |
| (f) | Mr. Manjunath BS | Project Coordinator, (BVIL) |
| (g) | Mr. Vijay HV | Manager, NDT & RR, BVIL |
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| (i) | Brig DN Bhatt | Dy MD, HQ AWHO |
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| (l) | Col MN Nair (Retd) | Exe Member, RWA |
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| (n) | Col NN Pillai (Retd) | Exe Member, RWA |
| (o) | Col PV Varghese (Retd) | Exe Member, RWA |

**Discussions and Decisions**

3. **Update on Backend Work at BVIL Bengaluru**. Mr Shantharaju stated that they have completed the slab design and analysis for all floors of Towers B and C, and they are proceeding with beam design. After this they shall be working on the columns and shear walls of both these towers. Pile evaluation will be completed in four days i.e. by the weekend.

4. **Timeline for Submission for Reports**. Dr Shantharaju stated that on 30 Apr 23 he would be submitting only the Analysis Report and the BOQ would take 10 more days post final report. President RWA stated that this was the same situation on 15 Oct 22 when it was expected that the Report and BOQ would be submitted simultaneously. Dr Shantharaju explained that the BOQ cannot be prepared till the final analysis report is prepared and will be prepared only on completion of the final analysis and the BOQ preparation will take min 10 days. After a detailed discussion with Dr Shantharaju, the BVIL team and RWA the undermentioned timelines were and agreed to :-

(a) Submission of Report of Analysis and Strengthening Methodology of Towers B and C (including Retaining Wall) – **30 Apr 23.** The final report would be sent to AWHO and RWA and their inputs if any will be incorporated.

(b) Submission of BOQ for Towers B and C – **10 May 23.**

(c) Submission of Analysis and BOQ of Tower A and Club House – **21 May 23.**

5. **Repairs of Lift Wall Cladding And Entrance Lobby Floor**. There was a bit of confusion from BVIL side during the discussion, whether the final BOQ will include repairs of lift wall cladding and entrance lobby (green marble) floor. Later, after detialed discussion with Mr Ravihankar, Dr Shantharaju confirmed that besides structural repairs the BOQ will cover all non-structural repairs including lift wall cladding, retaining wall, entrance lobby (green marble) floor etc.

6. **Additions to BOQ**. PD stated that the following repairs be added to the BOQ since these would not be taken up separately as previously decided and the same was agreed by BVIL :-

(a) Repairs of Water Tank of Club House.

(b) Repair and fixing of 200 wall cladding tiles which was previously planned to be done immediately. This additional quantity is in addition to the repair of other wall cladding which was noticed and earmarked during the distress survey.

7. **Points by President RWA**.

(a) **Distress Mapping**. President RWA requested if the distress map (PDF copy) can be submitted by 15 Apr 23. BVIL agreed to share the same and said that they will email the PDF of distress maps (will also be part of the final report) prepared by 15 Apr 23.

(b) **Inclusion of Additional Distress**. President RWA mentioned that the residents have reported a few additional defects and the same will be shared via email to BVIL and the same should be added to the distress map. Dr Shantharaju agreed that all such defects would be added.

8. **Submission of Details of Three Specialist Agencies**. PD reiterated that the list of the agencies should be submitted along with the Reports of Towers B and C on 30 Apr 23 and the same was agreed to by BVIL.

9. **Next Review**. 25 April 23 was agreed by all.

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# REFERENCES


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31. Comparison of remaining service life predicted from different models for case study examples. Sl. No. Location Year Remaining service life tcr, years Bazant model Morinaga's model Wang & Zhao's model IRC model 1 Vachon bridge, Laval, Canada (Case-i) 1997 162 110 158 34 2
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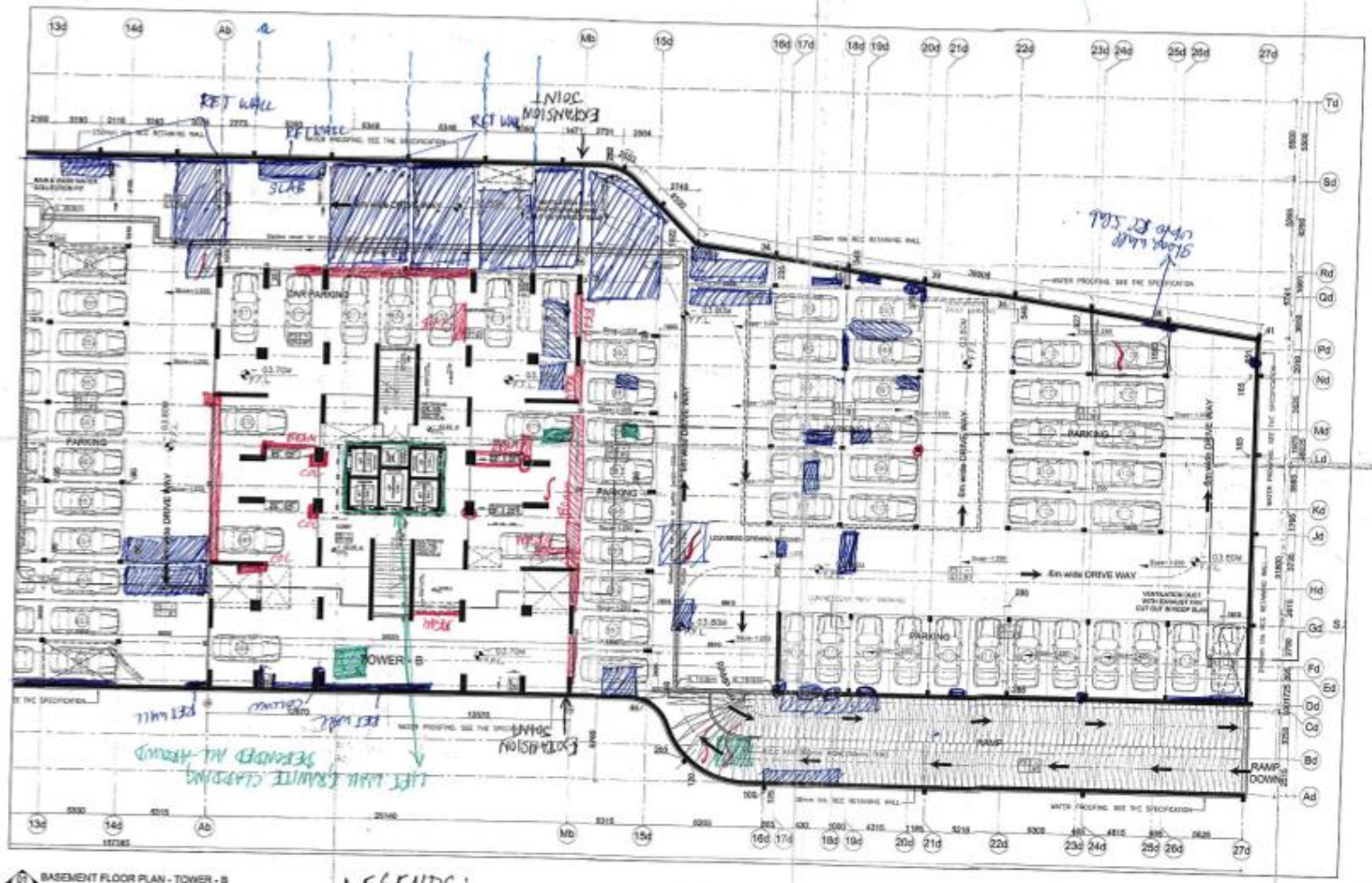


BASEMENT FLOOR PLAN - TOWER - B
SCALE - 1:125

LEGENDS;

- Spalling of cover Concrete / Exposure of Rebars / Corrosion Cracks
- Dampness / Damp Patches / Peeling of Paint
- Patch work done / Treated members.

GENERAL NOTES

01. ALL DIMENSIONS ARE IN MILLIMETRES, AND ALL LEVELS ARE IN METERS
02. ALL DIMENSIONS TO BE VERIFIED ON SITE & APPROVED BY THE ENGINEER.
03. ALL LEVELS ARE RELATED TO PROJECT BENCH MARK ±0.00. TO BE DETERMINED ON SITE BY ENGINEER.
04. ANY DISCREPANCY IN THE DRAWING SHOULD BE BROUGHT IMMEDIATELY TO THE NOTICE OF THE ARCHITECT
05. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH OTHER RELEVANT ARCHITECTURAL, CIVIL, STRUCTURAL, MECHANICAL AND ELECTRICAL DRAWINGS OF ALL SECTIONS OF THE SPECIFICATIONS.
06. ALL HEIGHTS SHOWN IN THIS DRAWINGS ARE FROM FINISHED FLOOR LEVEL UNLESS OTHERWISE SPECIFIED.
07. SH - INDICATES SILL HEIGHT FROM FINISHED FLOOR LH - INDICATES LINTEL HEIGHT FROM FINISHED FLOOR FBM - INDICATES BOTTOM OF BEAM
08. FINISHES

FLOOR FINISH — SKIRTING FINISH
CEILING FINISH — WALL FINISH

FINISHES SCHEDULE

| | |
|---|---|
| F1 | VITRIFIED FLOOR TILES |
| F2 | CERAMIC FLOOR TILES |
| F3 | NON SLIPPERY CERAMIC FLOOR TILES |
| F4 | CEMENT CONCRETE FLOORING |
| F5 | 82MM THICK CONCRETE FLOORING WITH NON METALIC HARDNER |
| F6 | 18MM THICK UDAIPUR MARBLE |
| S1 | VITRIFIED TILE SKIRTING |
| S2 | CERAMIC SKIRTING |
| W1 | PLASTER & PAINT |
| W2 | CERAMIC WALL TILES |
| W3 | GRANITE WALL CLADDING |
| C1 | CEILING (PLASTERING & PAINT) |
| C2 | FALSE CEILING |

031

KEY PLAN

| REV | DESCRIPTION OF REVISION WITH REASON IF ANY | DATE | CHKD. | AUTHORISED |
|---|---|---|---|---|
| 04 | REVISED CHAIN CLOSED | 30.03.12 | AAS | |
| 03 | VENTILATION DUCTS & COLUMN ADDED | 22.12.11 | PRK | |
| 02 | CHANGE IN ARCHITECTURAL Dwg. | 15-07-11 | PRK | |
| 01 | RETAINING WALL MODIFIED | 29-05-2010 | | |

AJIT ASSOCIATES
ARCHITECTURAL CONSULTANTS PVT. LTD.
ARCHITECTS, PLANNERS & INTERIORS
2 ND. FLOOR, PUTHUMAN PLAZA,
KNOC JN., N.S. ROAD, KOCHI – 682011.
PH: 91-484-4072000, FAX: 91-484-4032517
email: ajitassociates@gmail.com

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INFRASTRUCTURE, STRUCTURAL, MEP & PROJECT MANAGEMENT CONSULTANTS
VENGANAN, DIMANS ROAD, KOCHI – 682016.
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email: info@awho.com

CLIENT: ARMY WELFARE HOUSING ORGANISATION
SOUTH HUTMENTS, KASHMIR HOUSE
RAJAJI MARG, NEW DELHI – 110 011

PROJECT: RESIDENTIAL COMPLEX FOR AWHO AT SILVER SAND ISLAND, COCHIN

DRAWING TITLE: TOWER B BASEMENT FLOOR PLAN

| | | | |
|---|---|---|---|
| DRAWN BY | [illegible] | DATE | 28-10-2011 |
| CHECKED BY | SARATH GIRIDHAR | CONVENOR | JOY HERMAN |
| APPROVED BY | AJIT | ISSUING OFFICER | |

SCALE 1:150 @ A1

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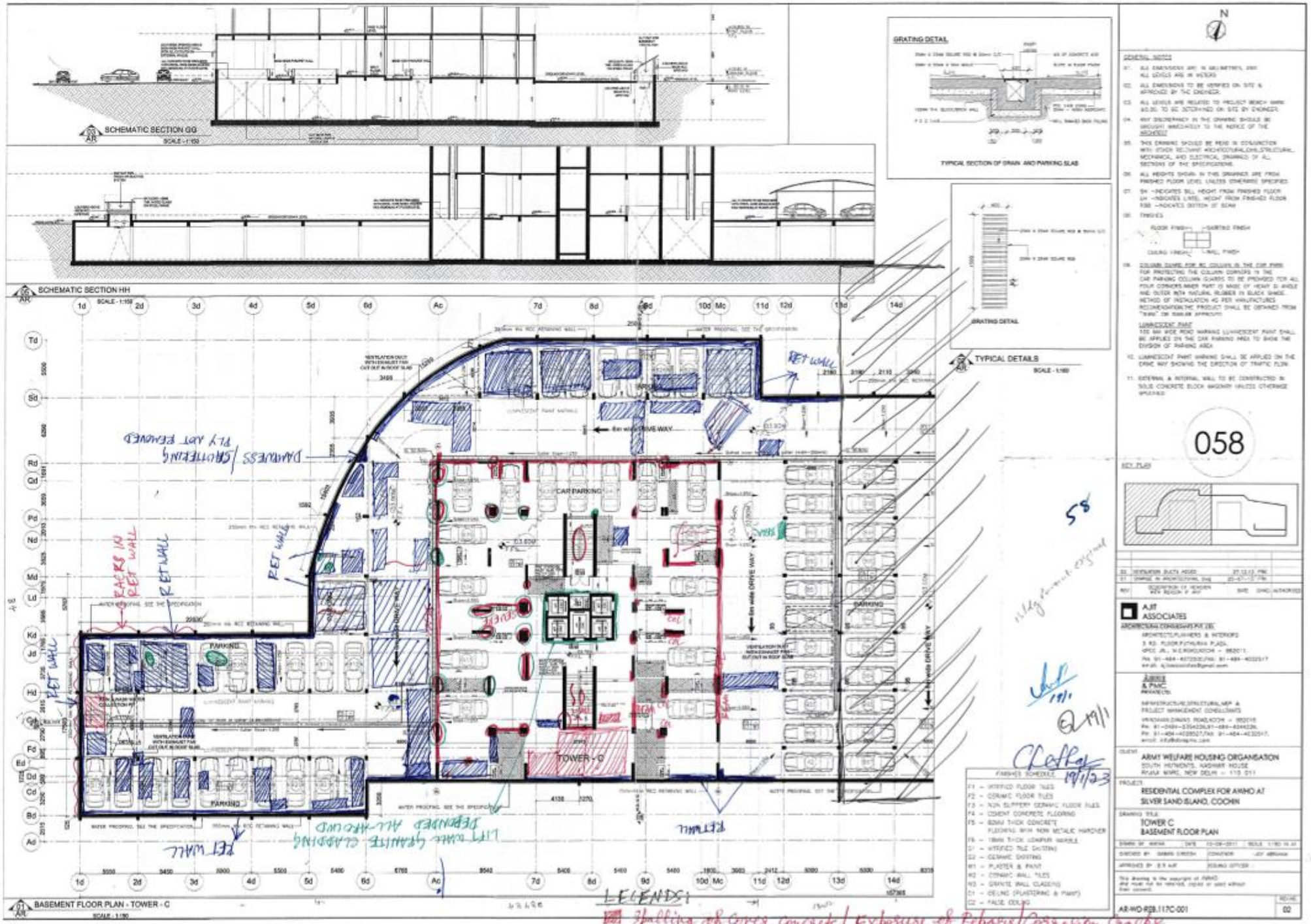
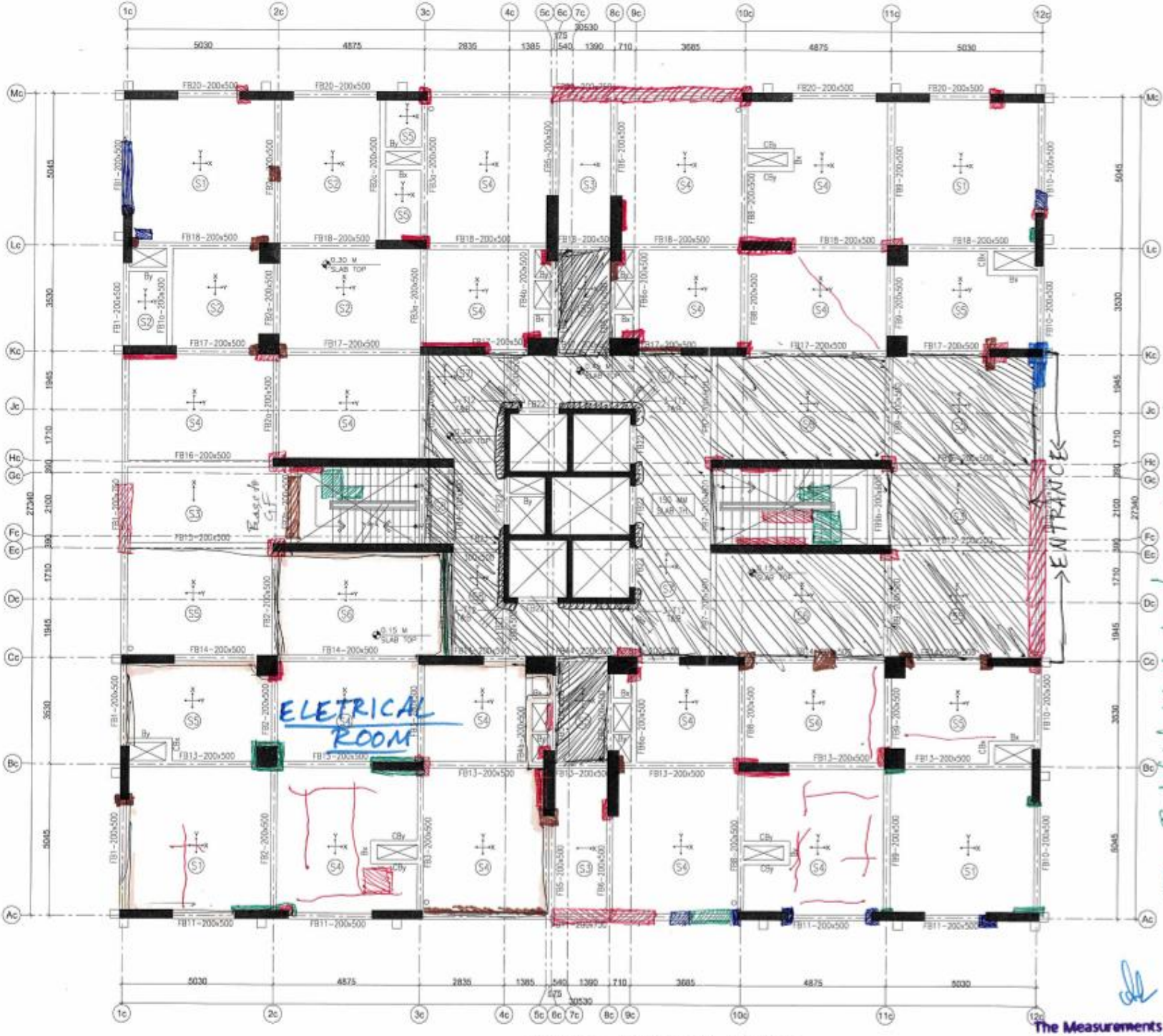
AR-WD-RES.1178-001 REV.NO. 04

For AJIT ASSOCIATES ARCHITECTURAL CONSULTANTS

19/1/12


SCHEMATIC SECTION GG
SCALE - 1:150
SCHEMATIC SECTION HH
SCALE - 1:150
BASEMENT FLOOR PLAN - TOWER - C
SCALE - 1:150
GRATING DETAIL
TYPICAL SECTION OF DRAIN AND PARKING SLAB
GRATING DETAIL
TYPICAL DETAILS
SCALE - 1:100
CAR PARKING
PARKING
TOWER - C
RET WALL
CRACKS IN RET WALL
DAMPNESS / SHOTTERING PLY NOT REMOVED
LIFT WELL GRANITE CLADDING REMOVED ALL AROUND
LEGENDS:
Spalling of Cover concrete / Exposure of Rebars / Corrosion Cracks
Dampness / Damp Patches / Peeling of Paint
Patch Work Done / Treated Members
GENERAL NOTES
TYPICAL DETAILS
SCALE - 1:100
058
KEY PLAN
AJIT ASSOCIATES
ARCHITECTS, PLANNERS & INTERIORS
ARMY WELFARE HOUSING ORGANISATION
SOUTH HUTMENTS, KASHMIR HOUSE
RAJAJI MARG, NEW DELHI – 110 011
RESIDENTIAL COMPLEX FOR AWHO AT
SILVER SAND ISLAND, COCHIN
TOWER C
BASEMENT FLOOR PLAN
AR-WD-RSB.117C-001
02




- Patch up Work done/ Treated monitoring
- Corrosion Cracks / Spalling of Cover Concrete / Exposure of Rebars
- Dampness / Damp Patches / Peeling of Paint
- Cracks in (Granite/marble) Flooring / Rebond of Marble/Granite) Cladding
- Cracks in Masonry Wall / Rebond of Plaster / Separation Cracks

TOWER-C GROUND FLOOR

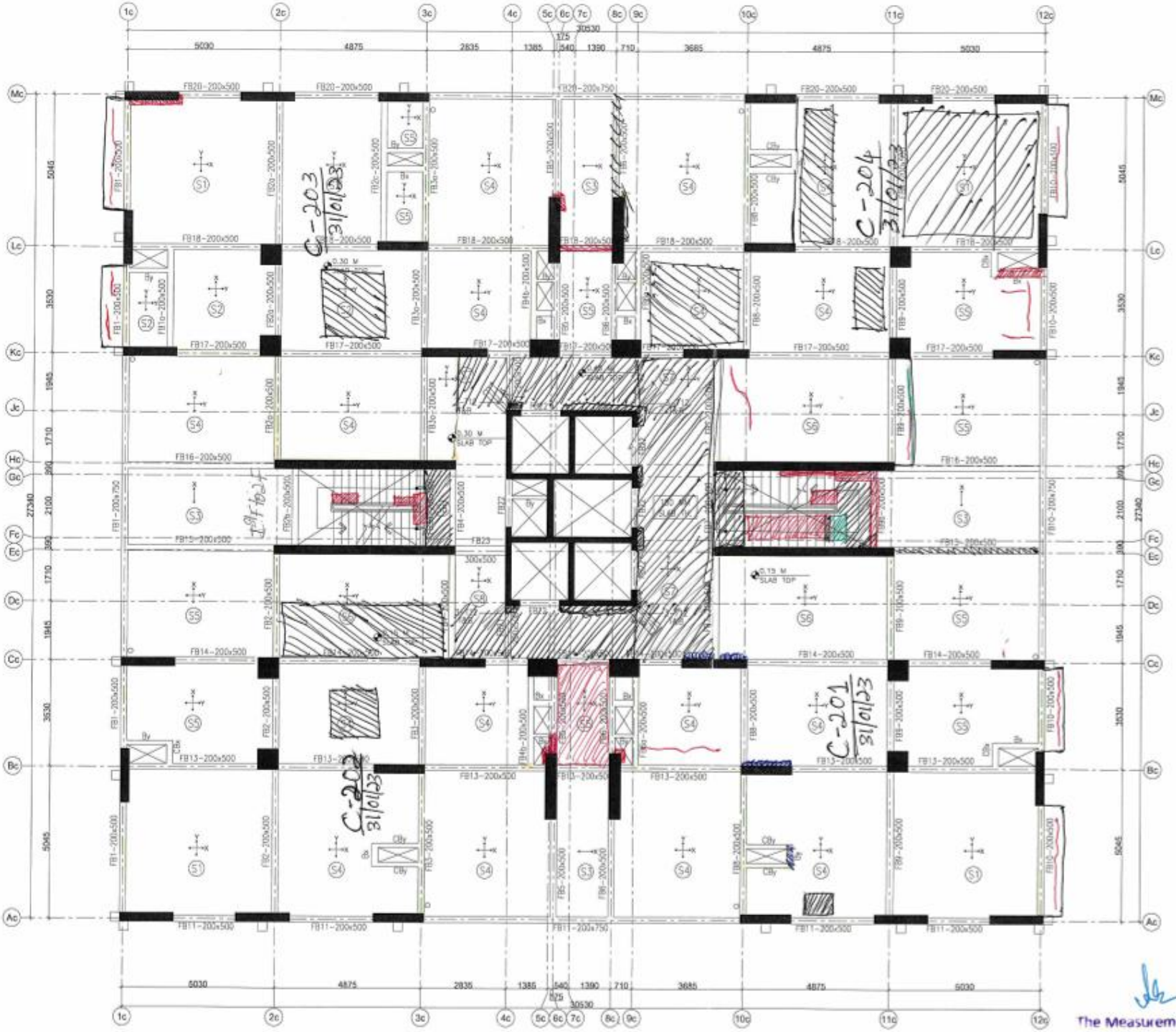
The Measurements on this page were taken on 26/1 26/01/2023

CHETHAN.H.P

TOWER-C FIRST FLOOR

(CHETHAN.H.R)

The Measurements on this page were taken on 28/01/2023

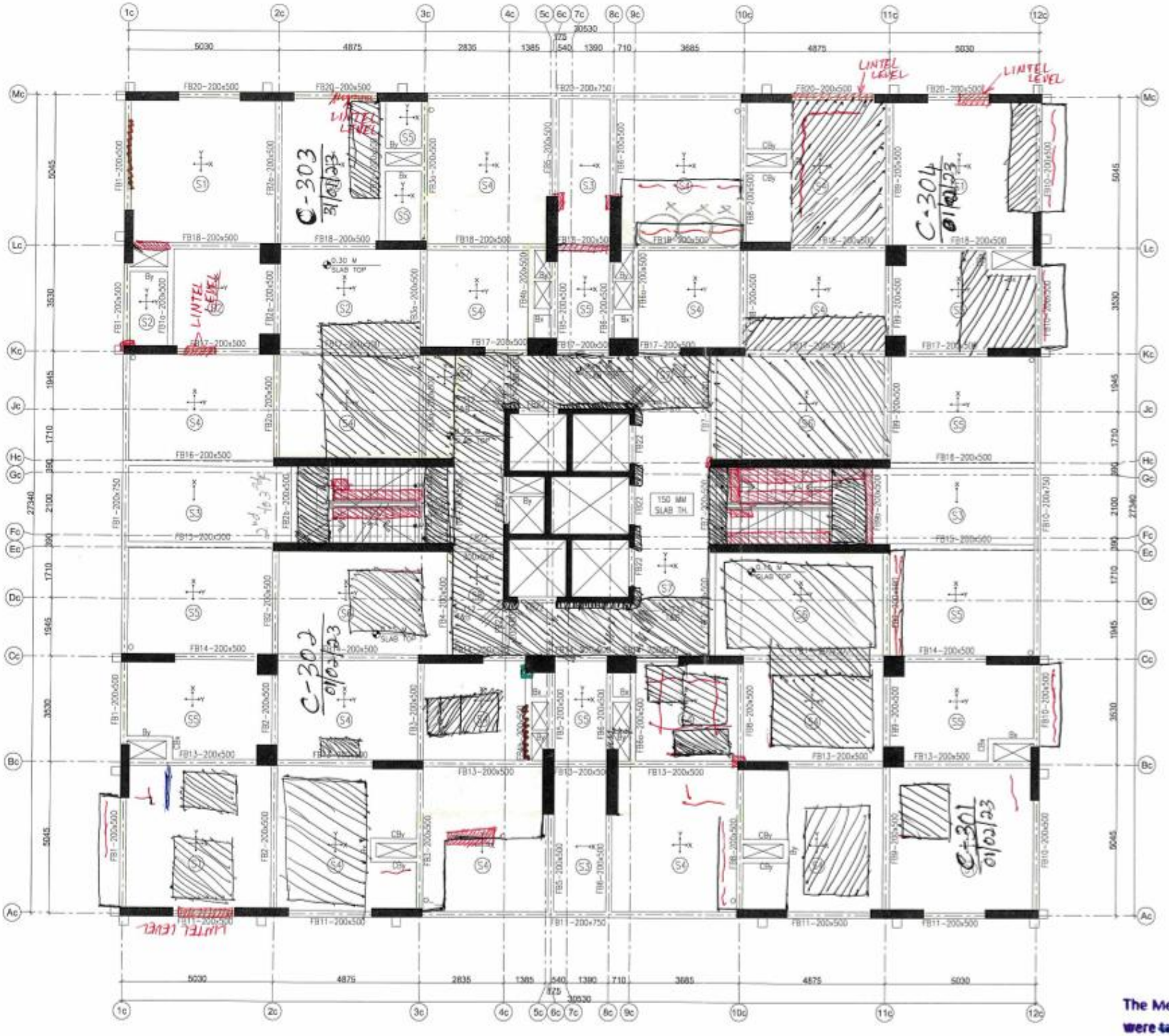



Clejps South side
2, 3, 4, 5
cracks.

Chethan
(CHETHAN.H.R)

The Measurements on this page were taken on 26/01/2023

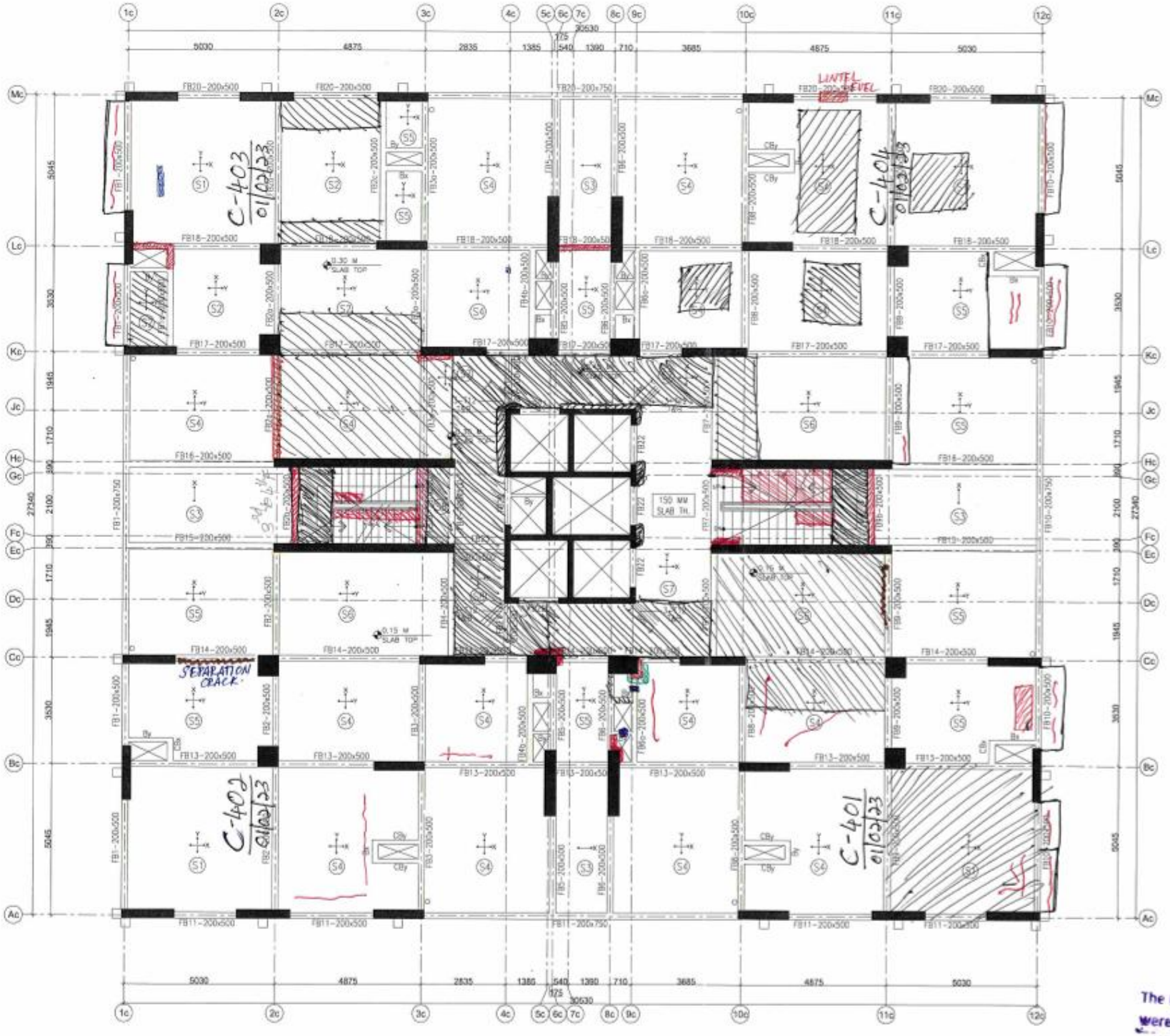
TOWER-C SECOND FLOOR




TOWER-C THIRD FLOOR

Chethan (CHETHAN.H.R)

The Measurements on this page were taken on ..... Completed 01/02




TOWER-C FOURTH FLOOR

Chethan (CHETHAN.H.R)

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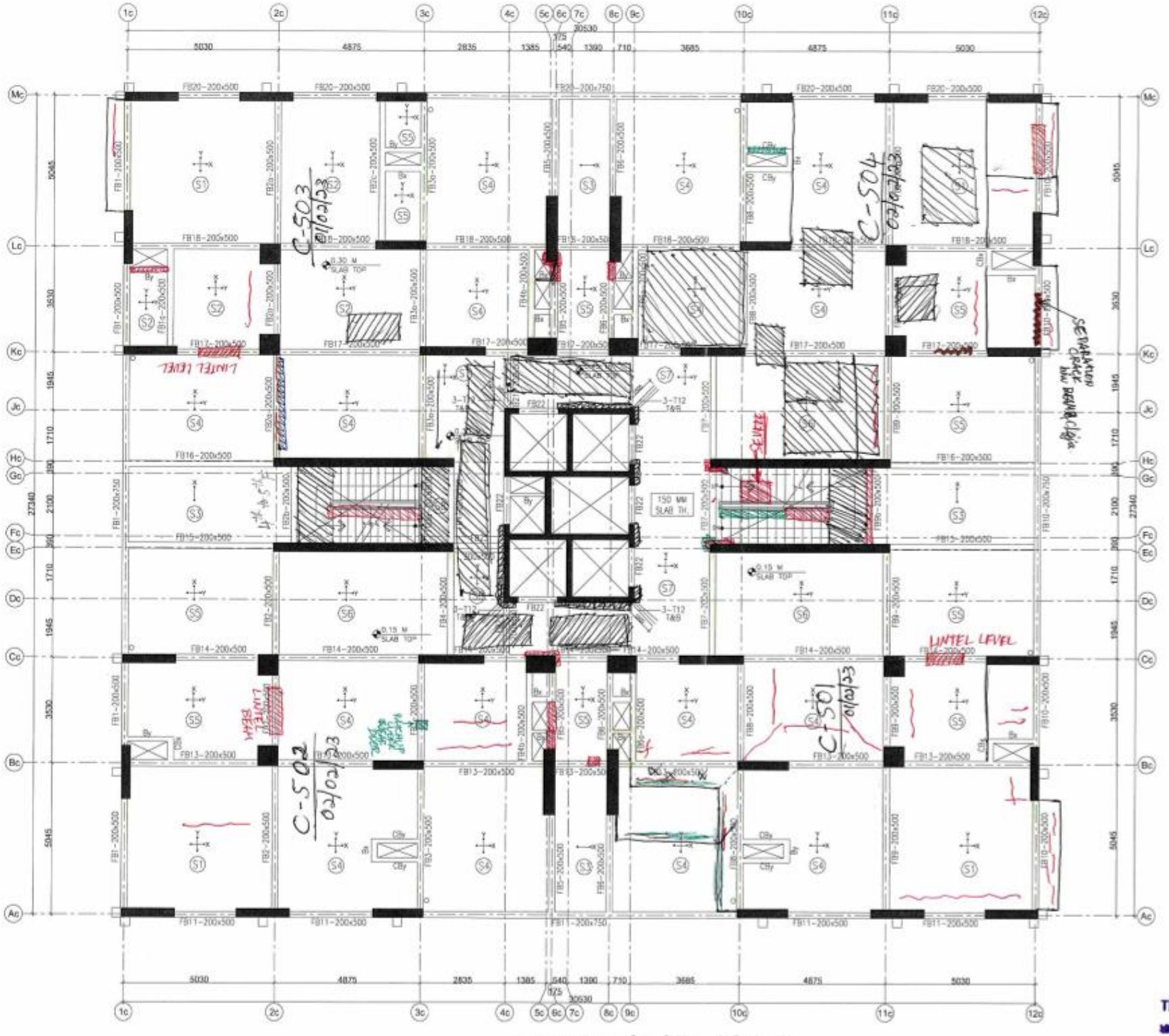
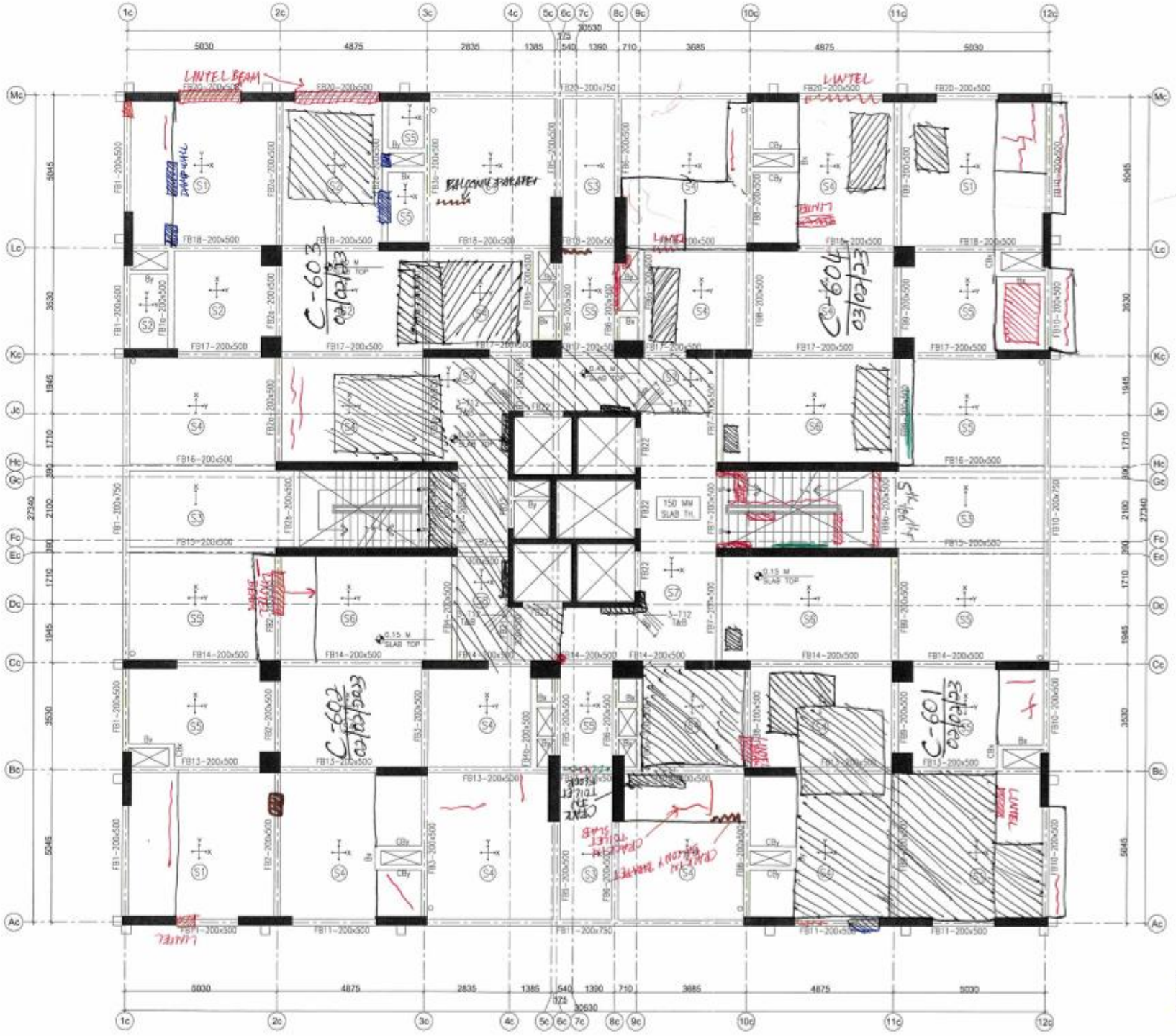



TOWER-C FIFTH FLOOR

(CHETHAN. H.P)

The Measurements on this page were taken on .....

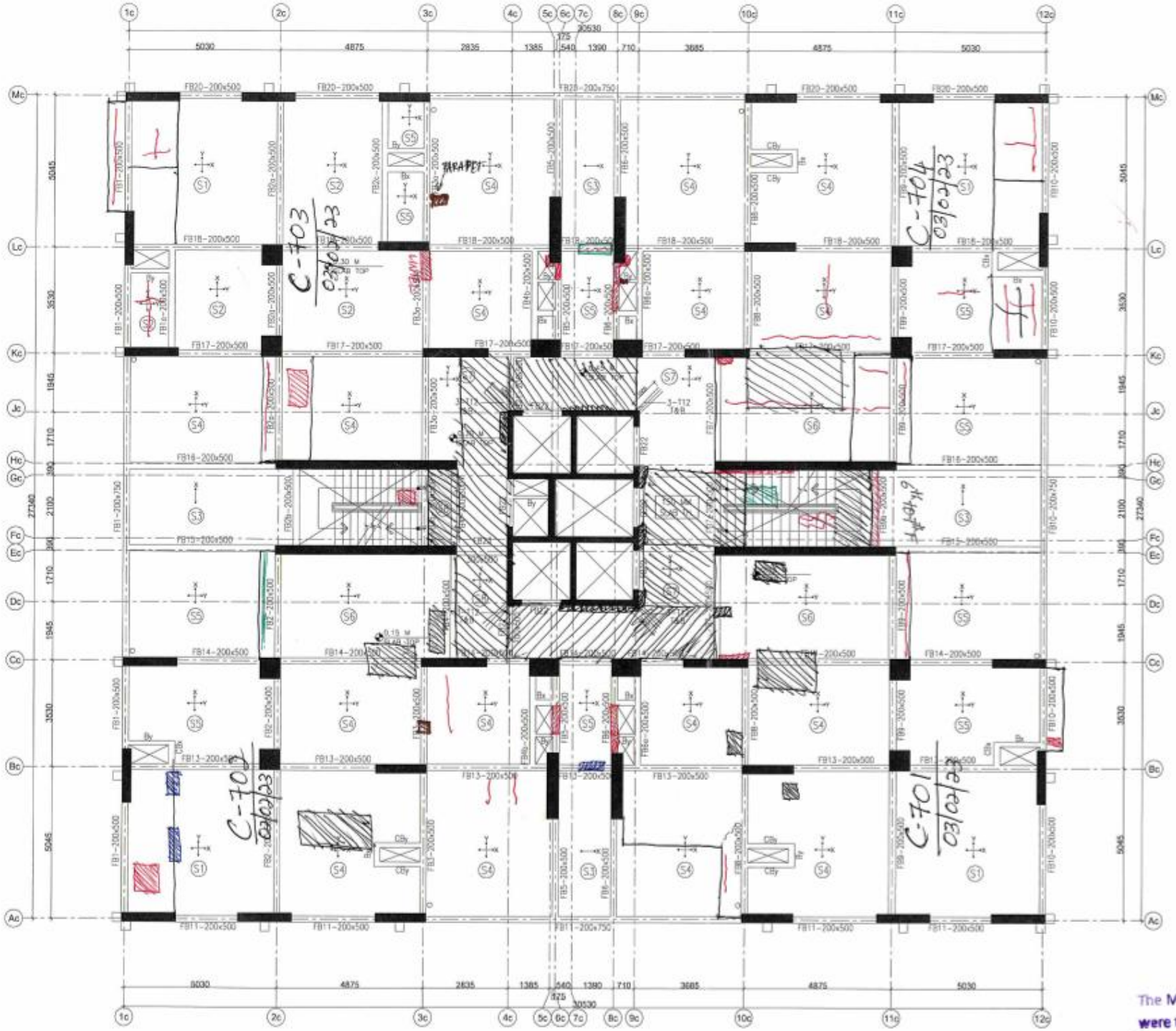
4/2 completed on 2/2




TOWER-C SIXTH FLOOR

(CHETHAN.H.R)

The Measurements on this page were taken on .....
Completed on 04/02




TOWER-C SEVENTH FLOOR

(CHETHAN.H.R.)

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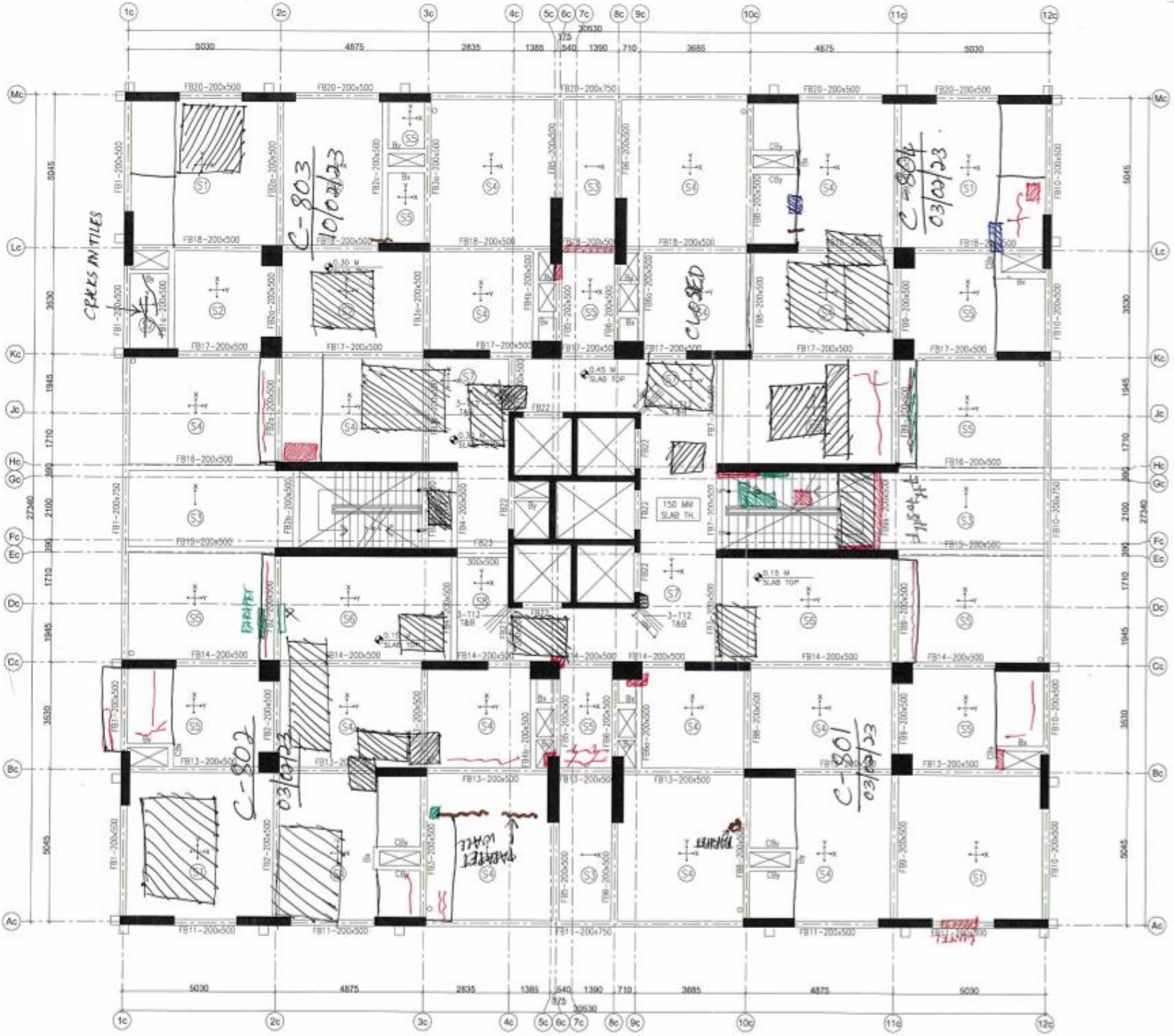
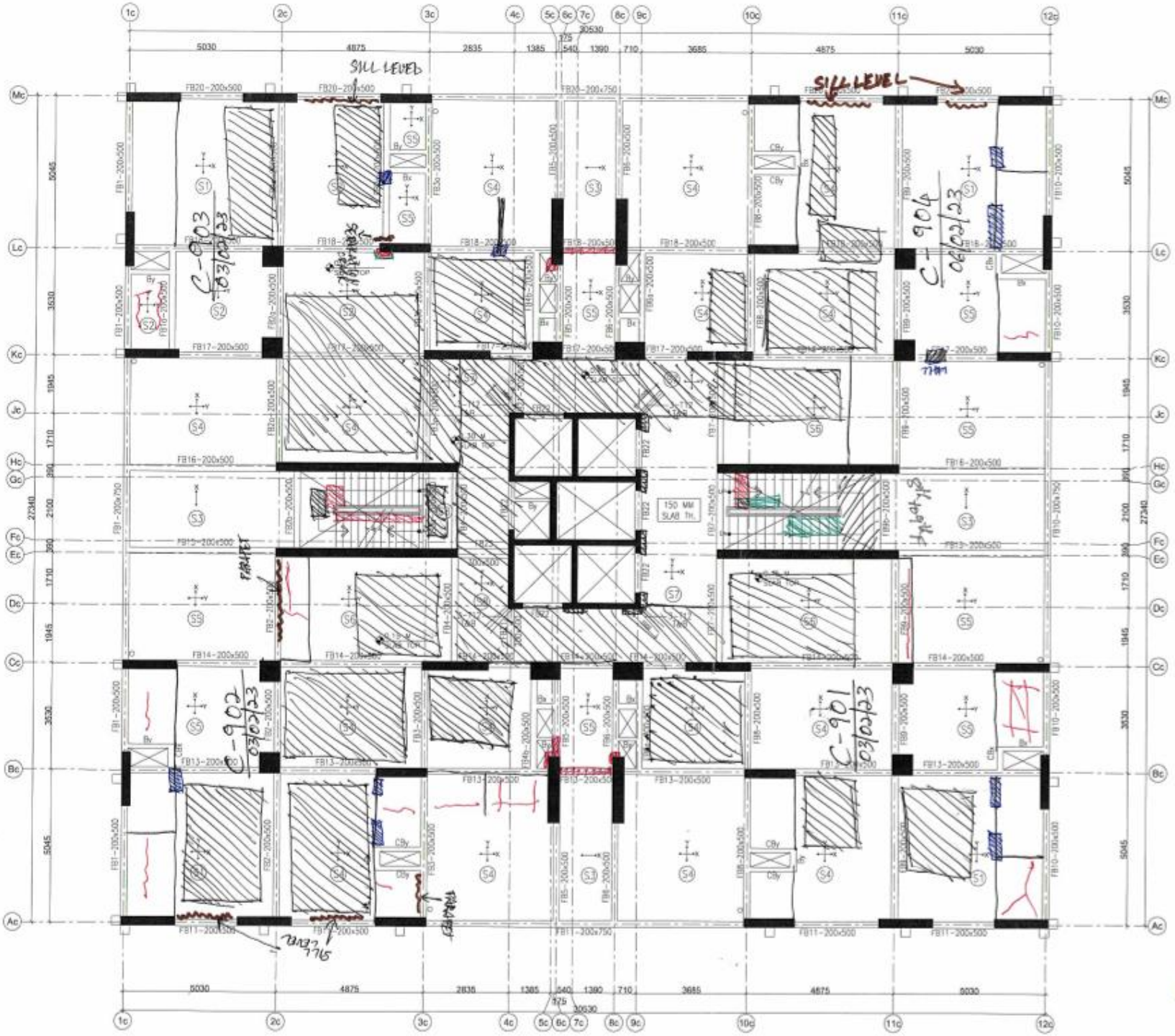



TOWER-C EIGHTH FLOOR

Sathar
(CHETHAN.H.R)

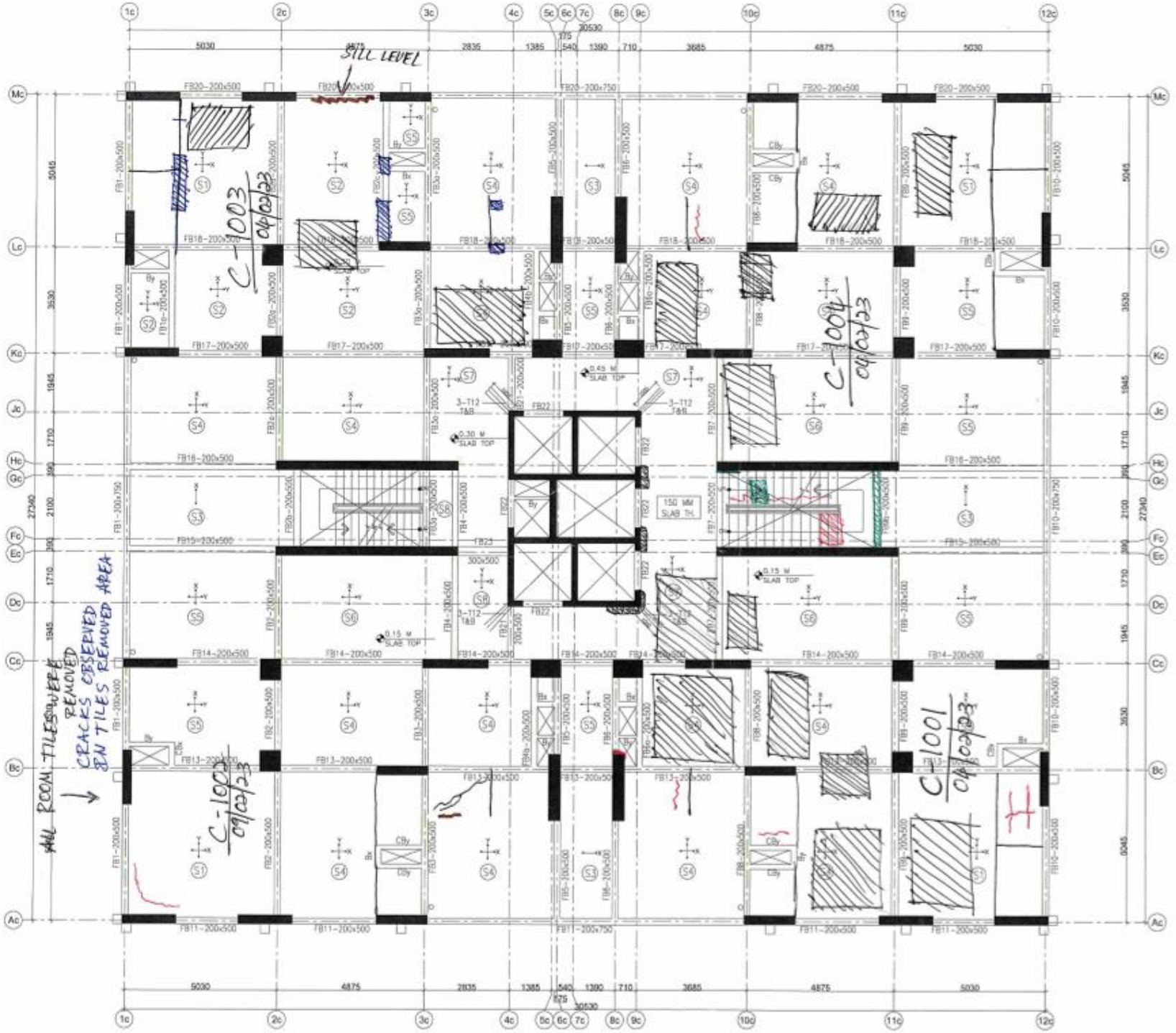
The Measurements on this page
were ~~taken on~~ Completed on 04/02




TOWER-C NINETH FLOOR

Chethan (CHETHAN.H.R)

The Measurements on this page were taken on .....
Completed on order




TOWER-C TENTH FLOOR

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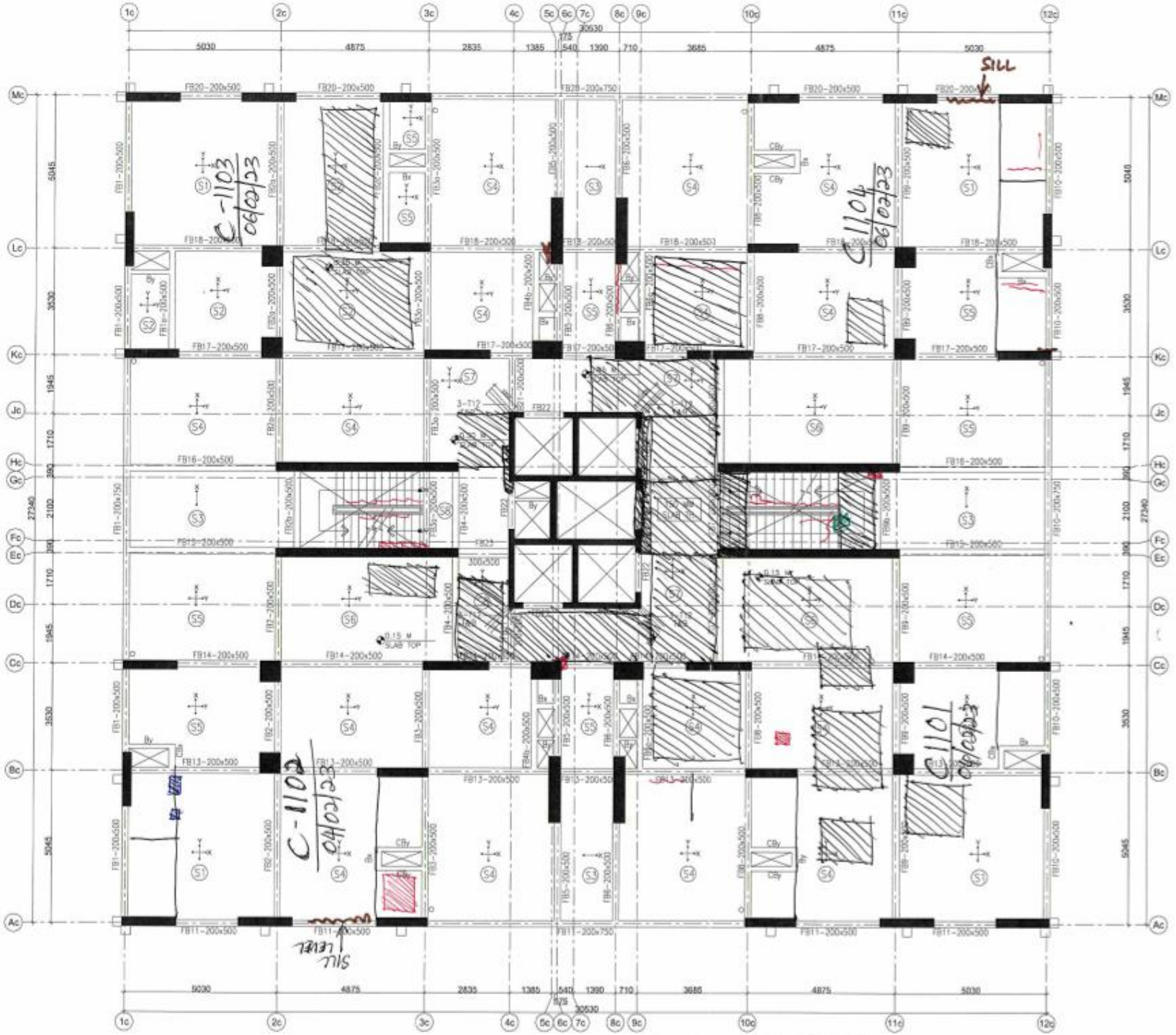


TOWER-C ELEVENTH FLOOR

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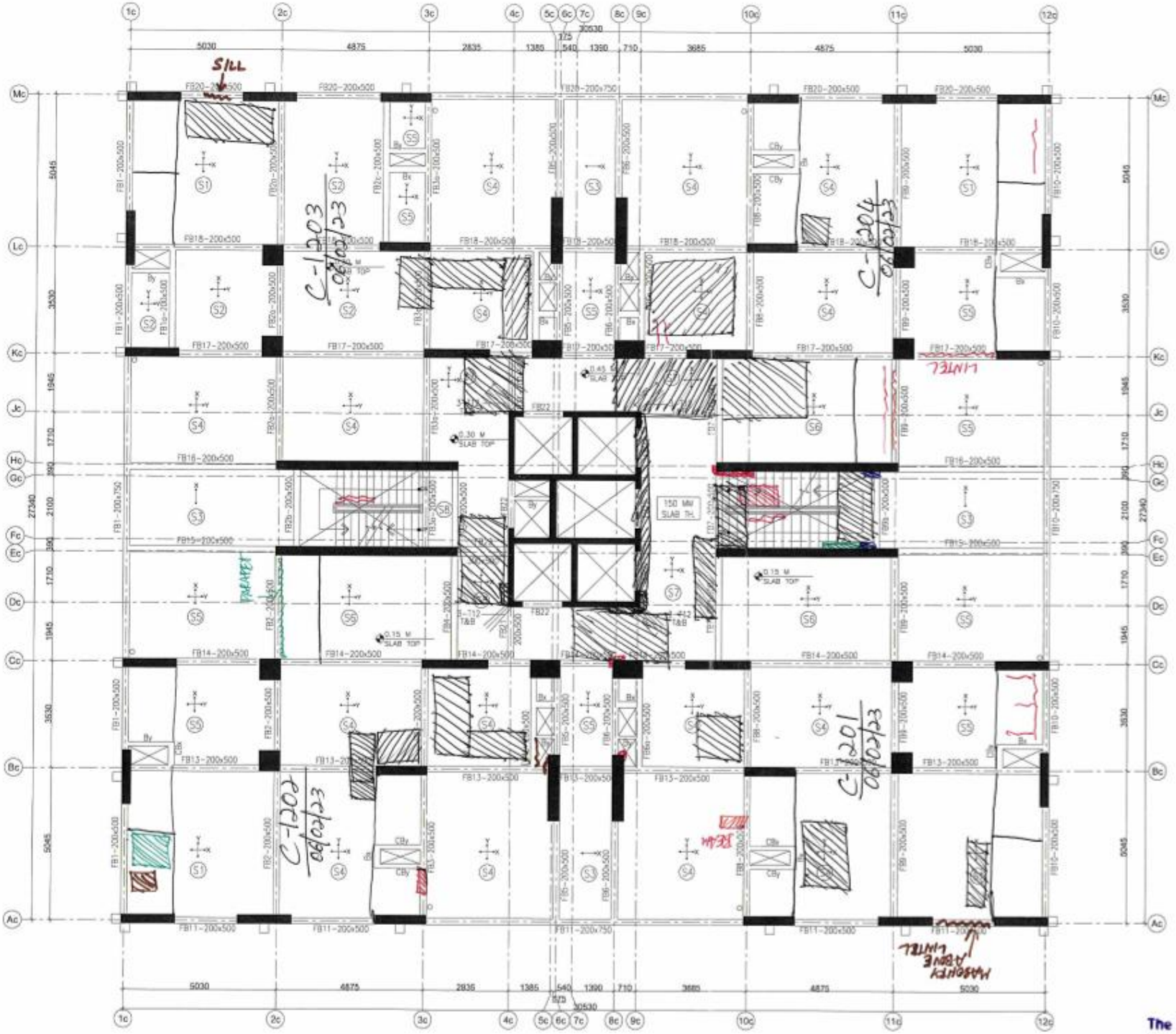


TOWER-C - TWELVETH FLOOR

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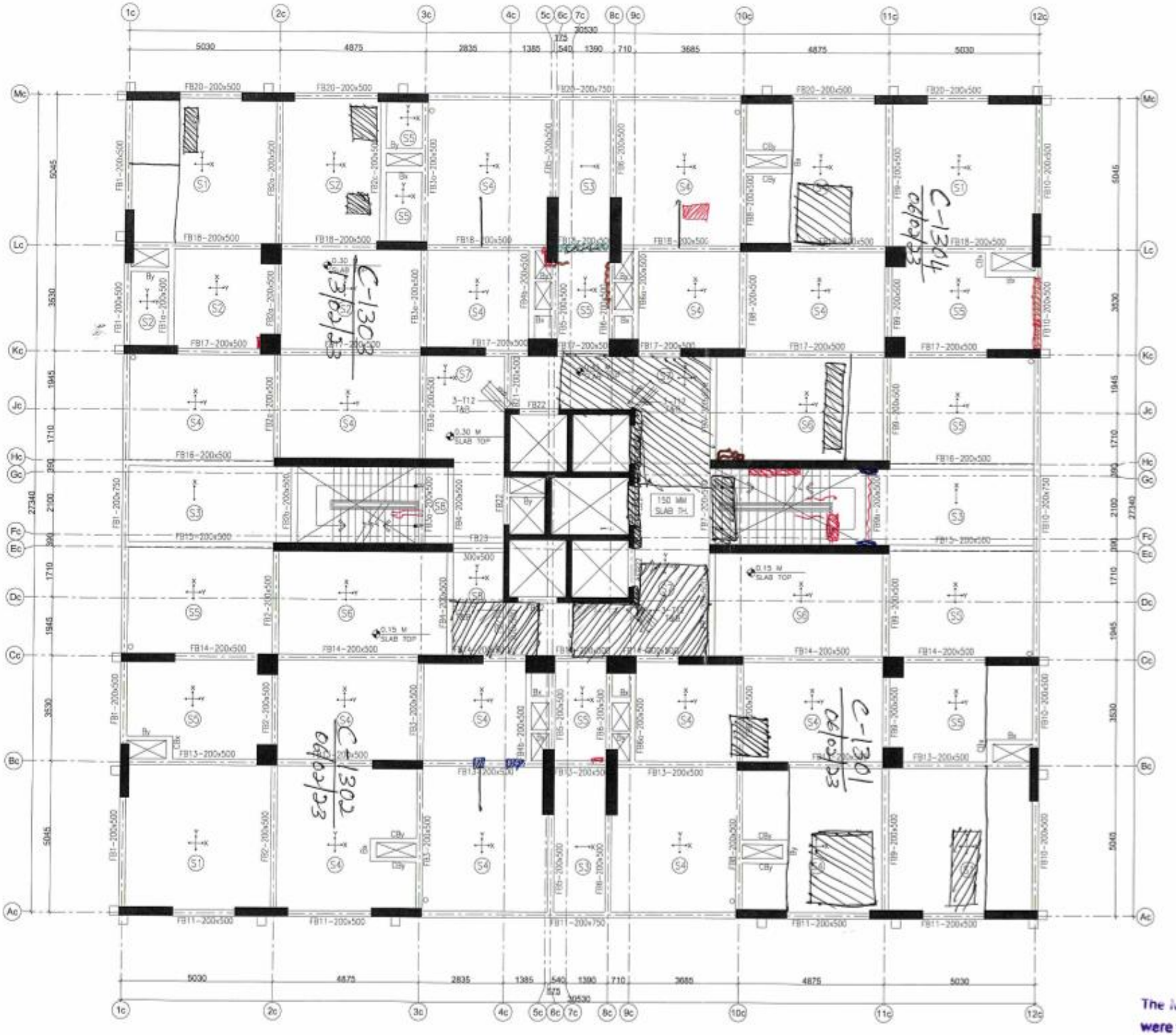
Completed




TOWER-C THIRTEENTH FLOOR

(CHETHAN.H.R)

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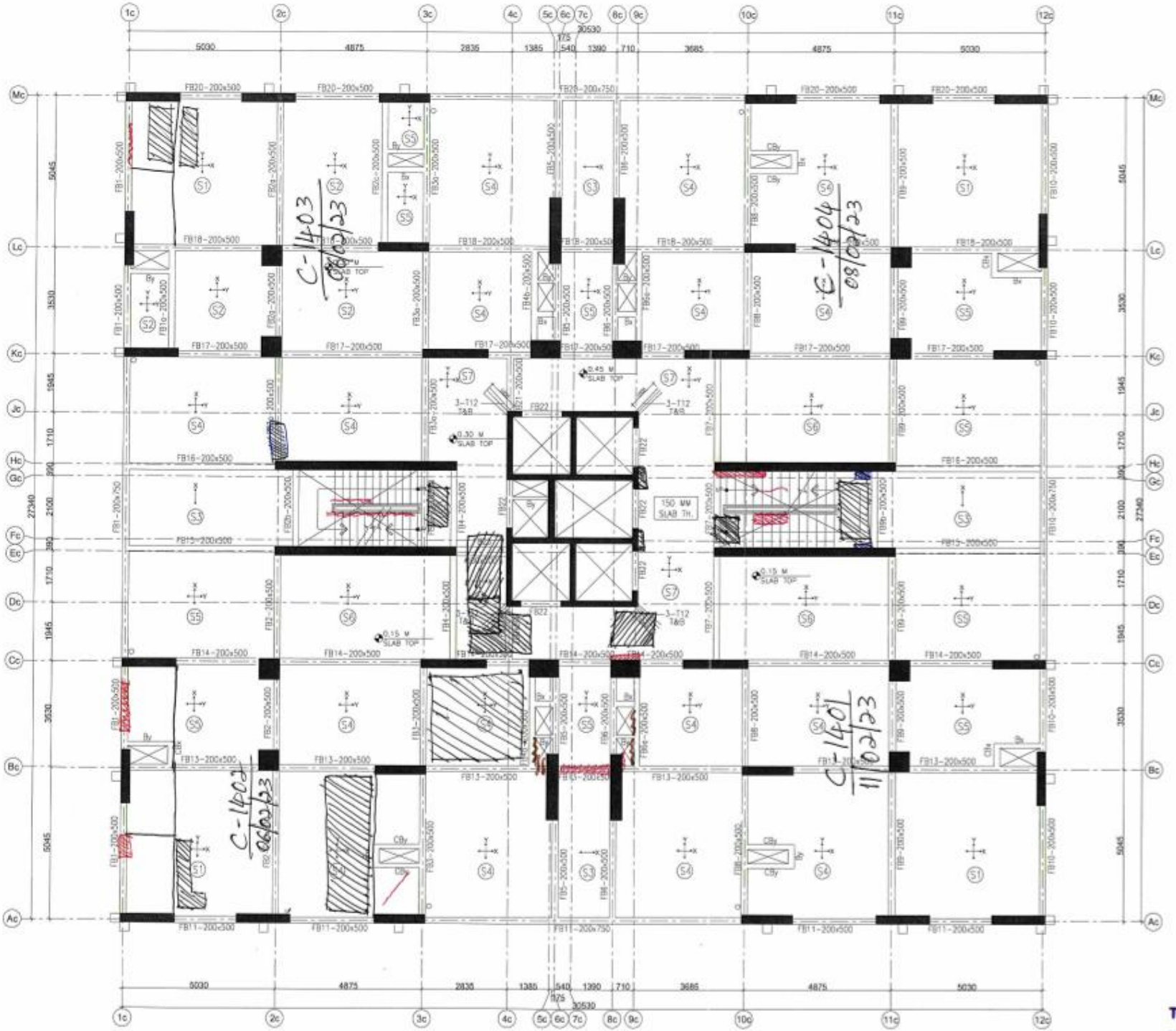
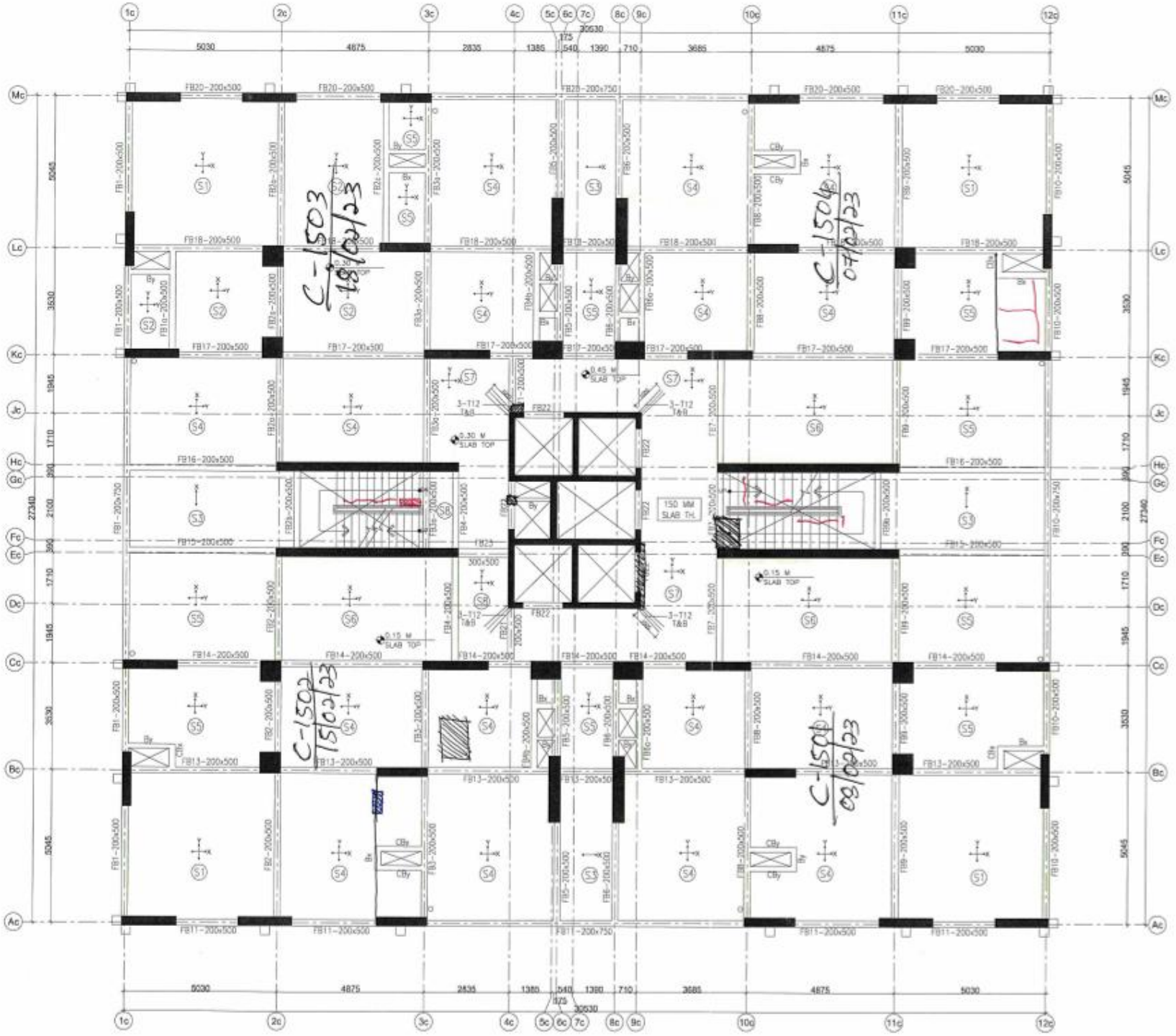



TOWER-C FOURTEENTH FLOOR

(CHETHAN.H.R)

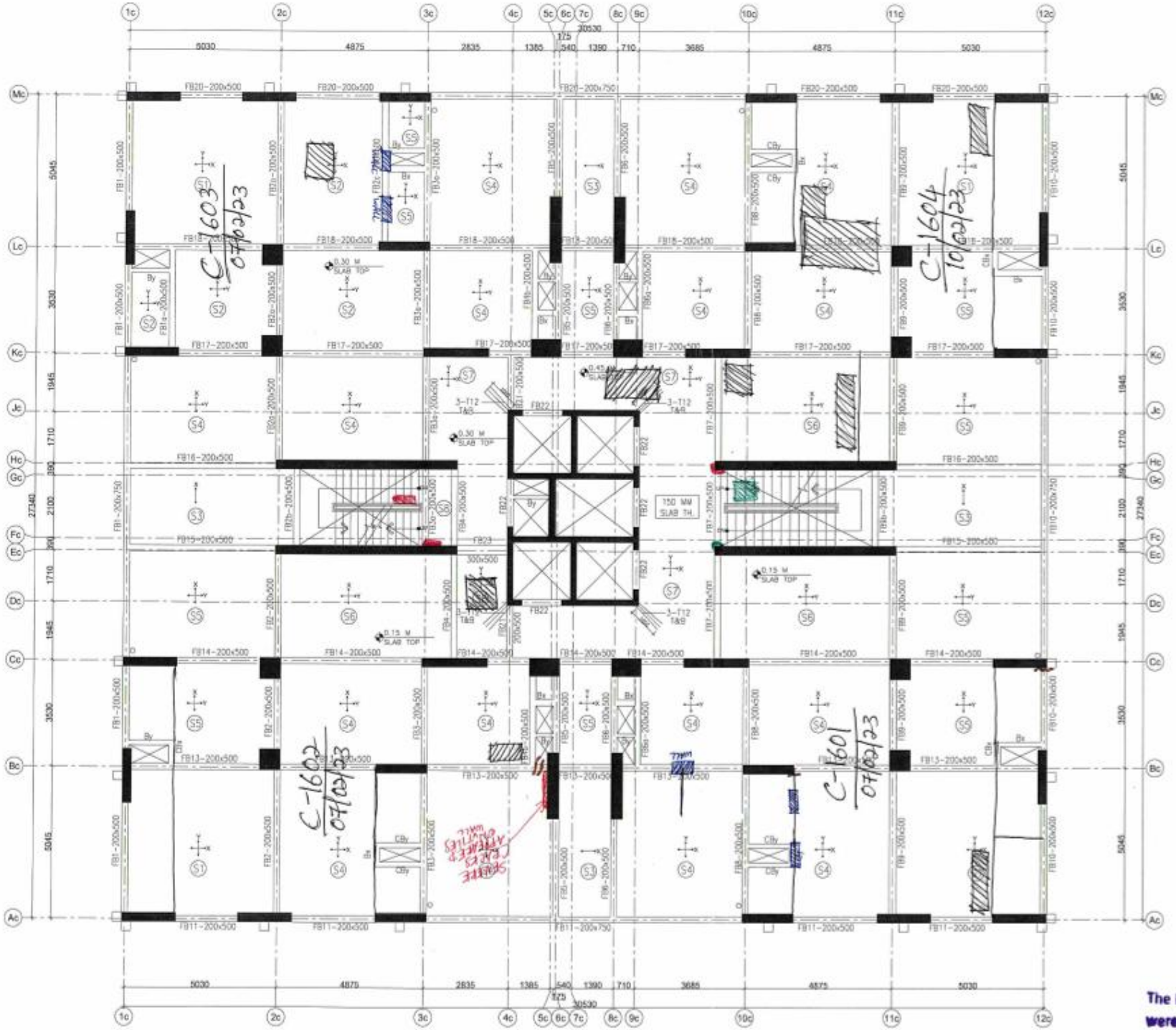
The Measurements on this page were taken on ..... 08/02/23 .....

Completed




TOWER-C FIFTEENTH FLOOR

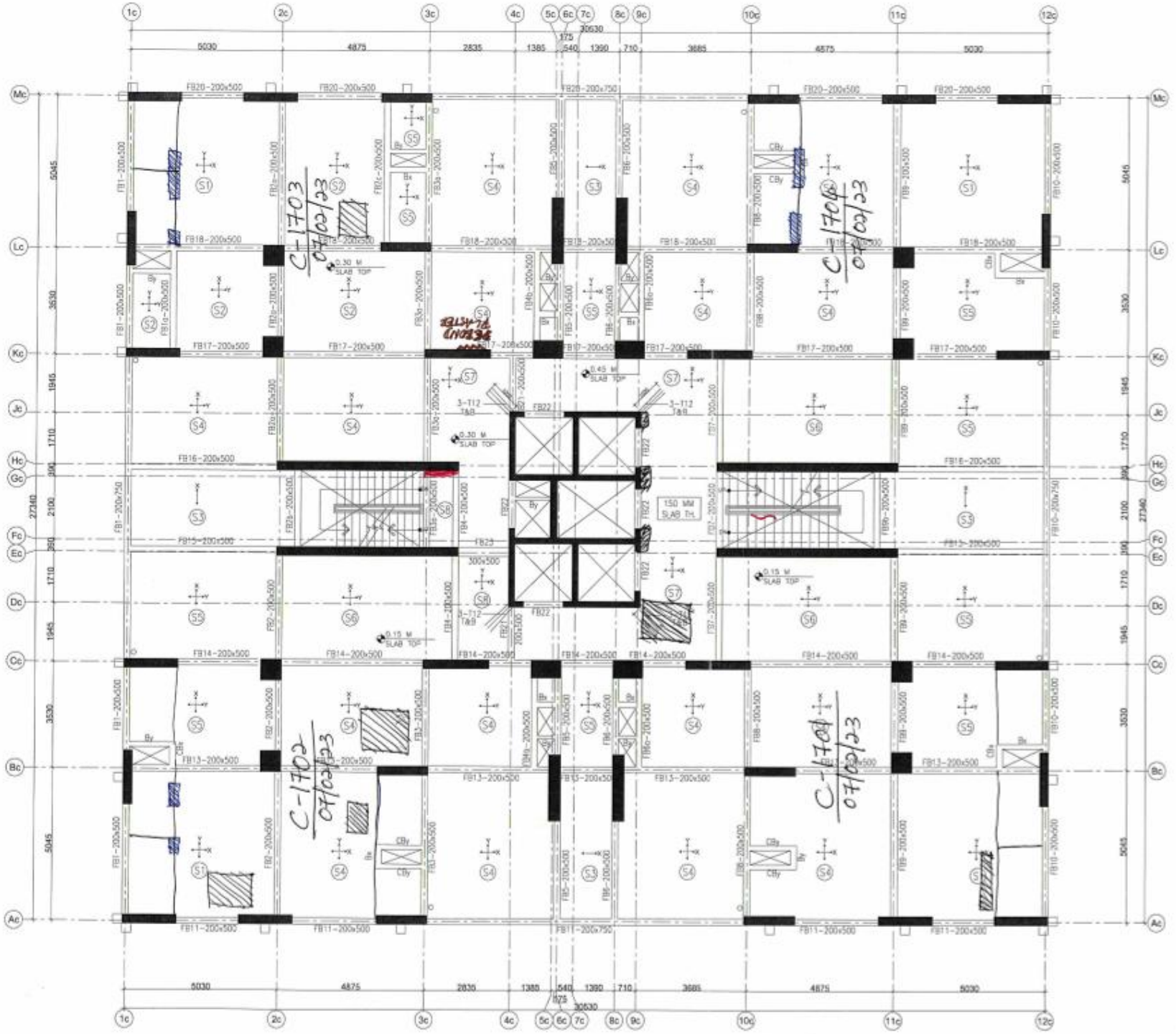
The Measurements on this page were taken on ..... 10/2...
Complete




TOWER-C SIXTEENTH FLOOR

Rathod
(CHETHAN. H. R)

The Measurements on this page were taken on .....




TOWER-C SEVENTEENTH FLOOR

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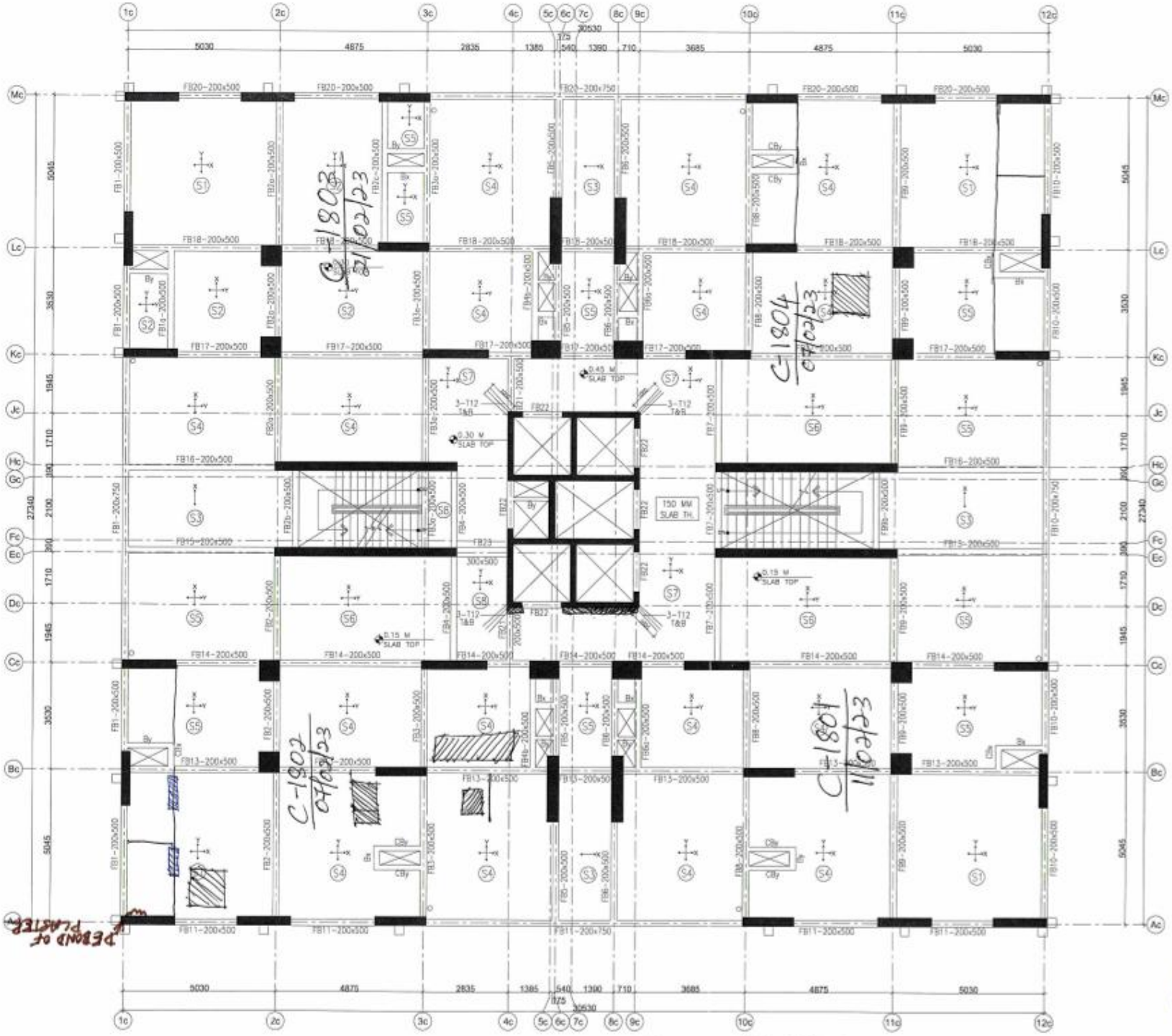
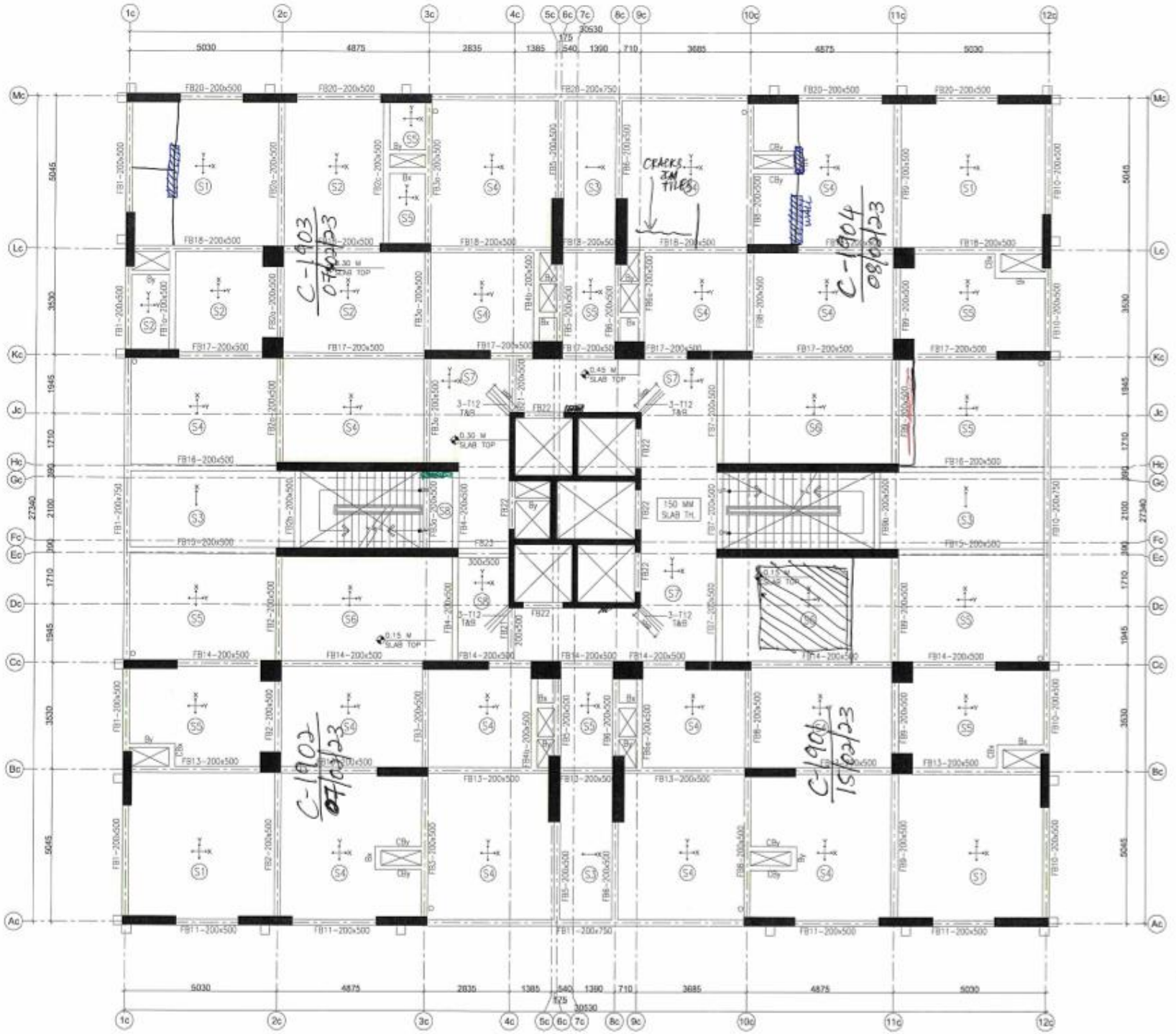



The Measurements on this page were taken on ..... the Complete

TOWER-C EIGHTEENTH FLOOR




The Measurements on this page were taken on .... n/a

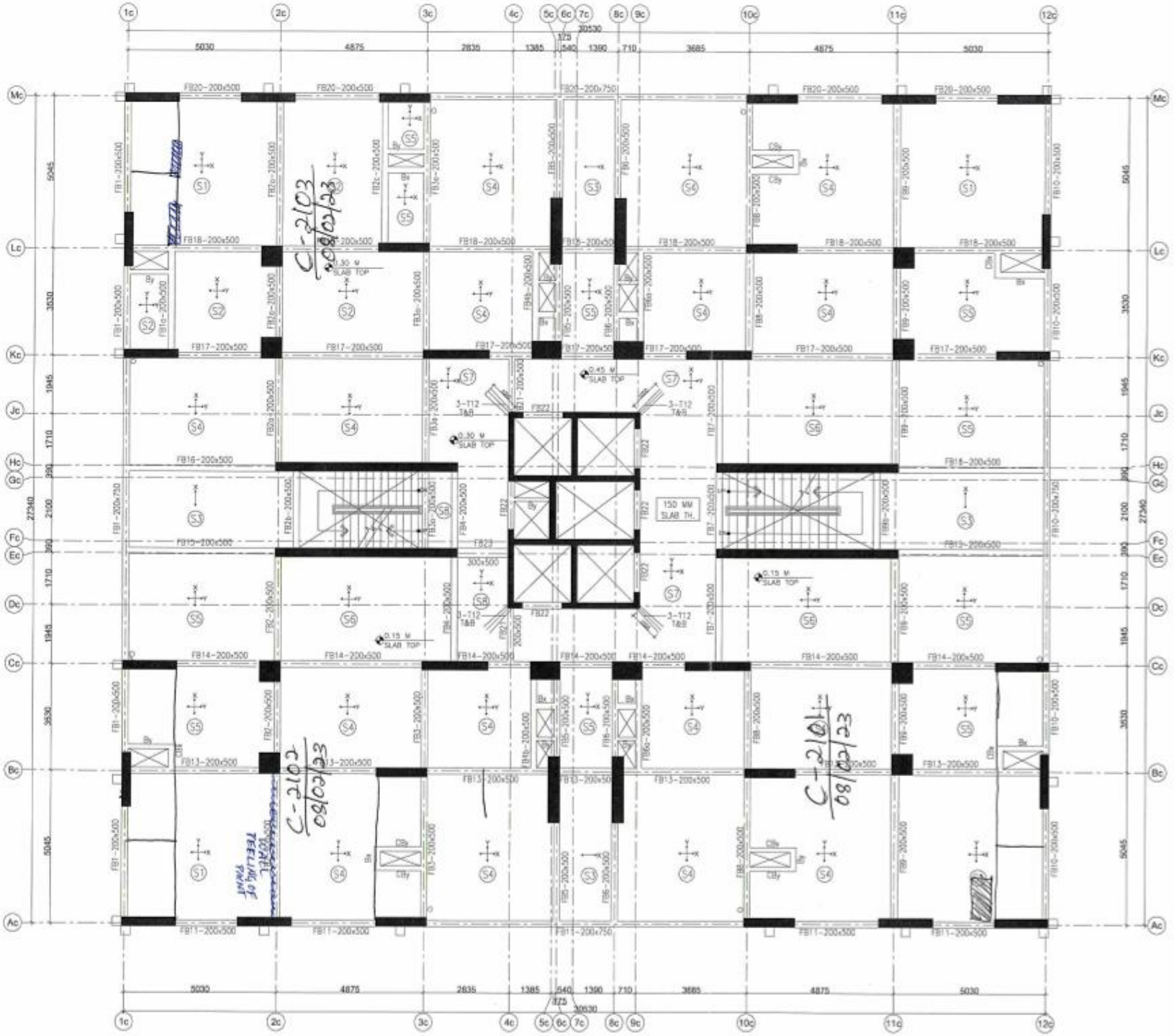
Completed

TOWER-C NINETEENTH FLOOR

The Measurements on this page were taken on ..... 10/2/23

Completed

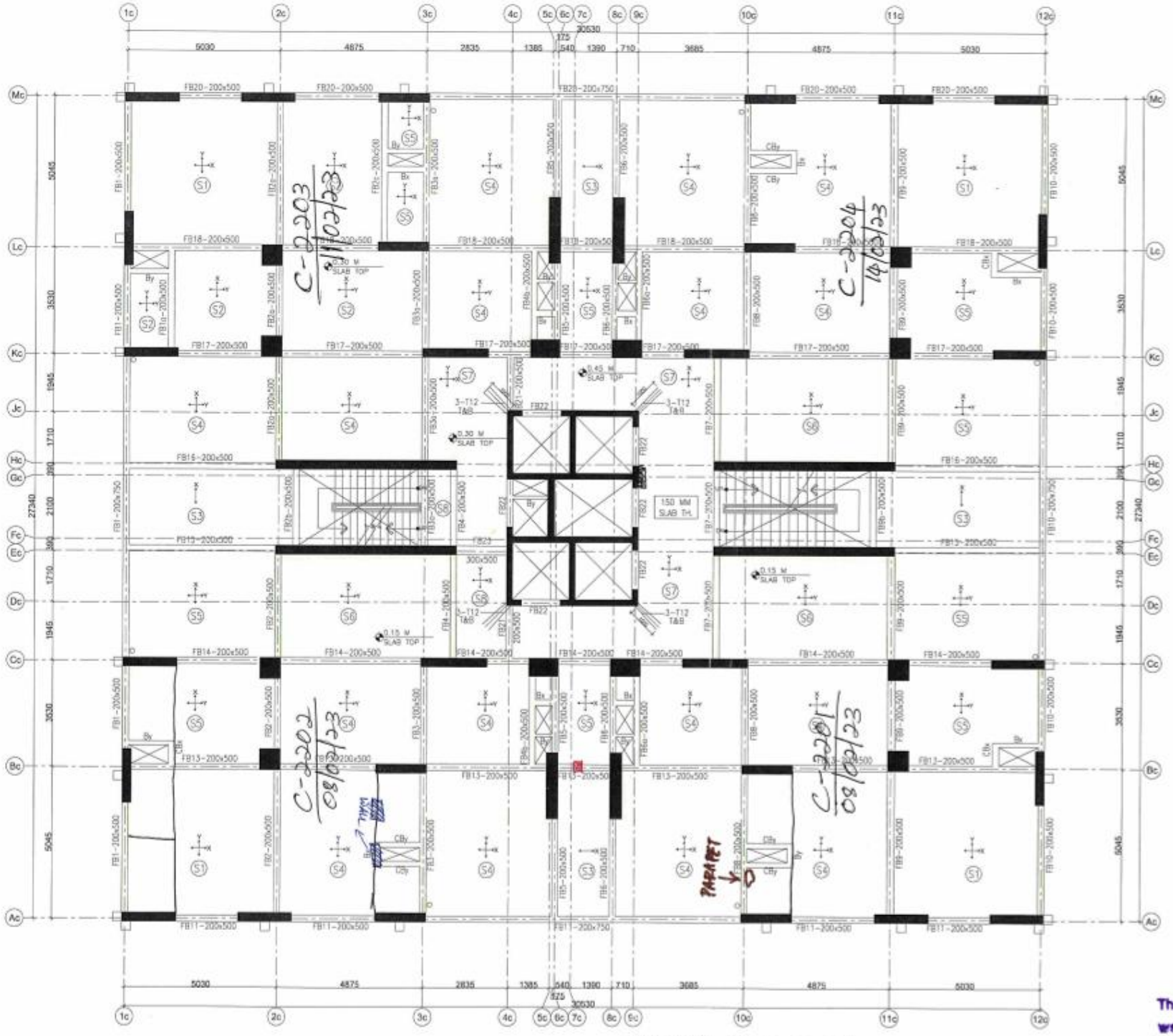
TOWER-C TWENTIETH FLOOR




The Measurements on this page were taken o..

Completing

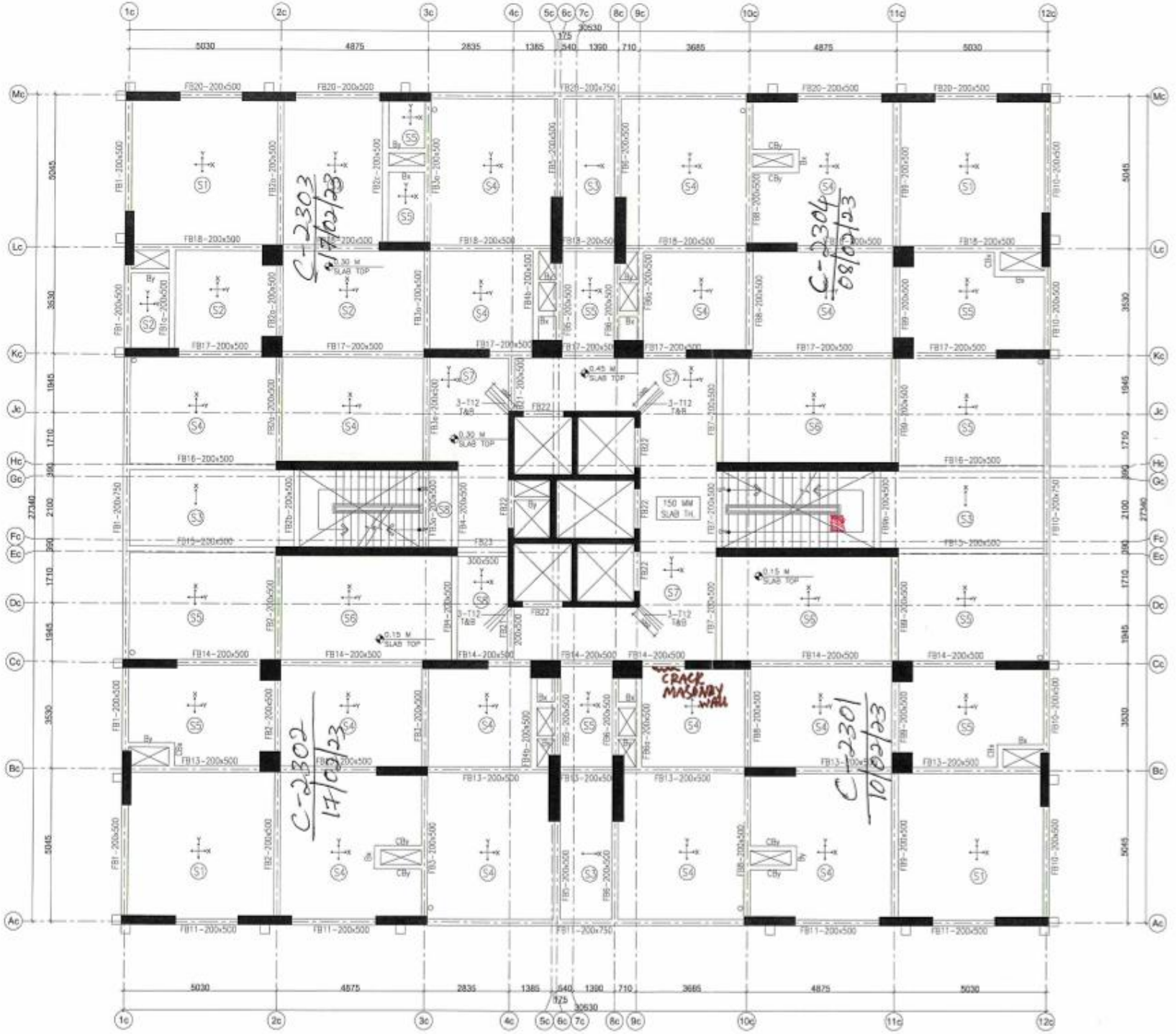
TOWER-C TWENTY FIRST FLOOR



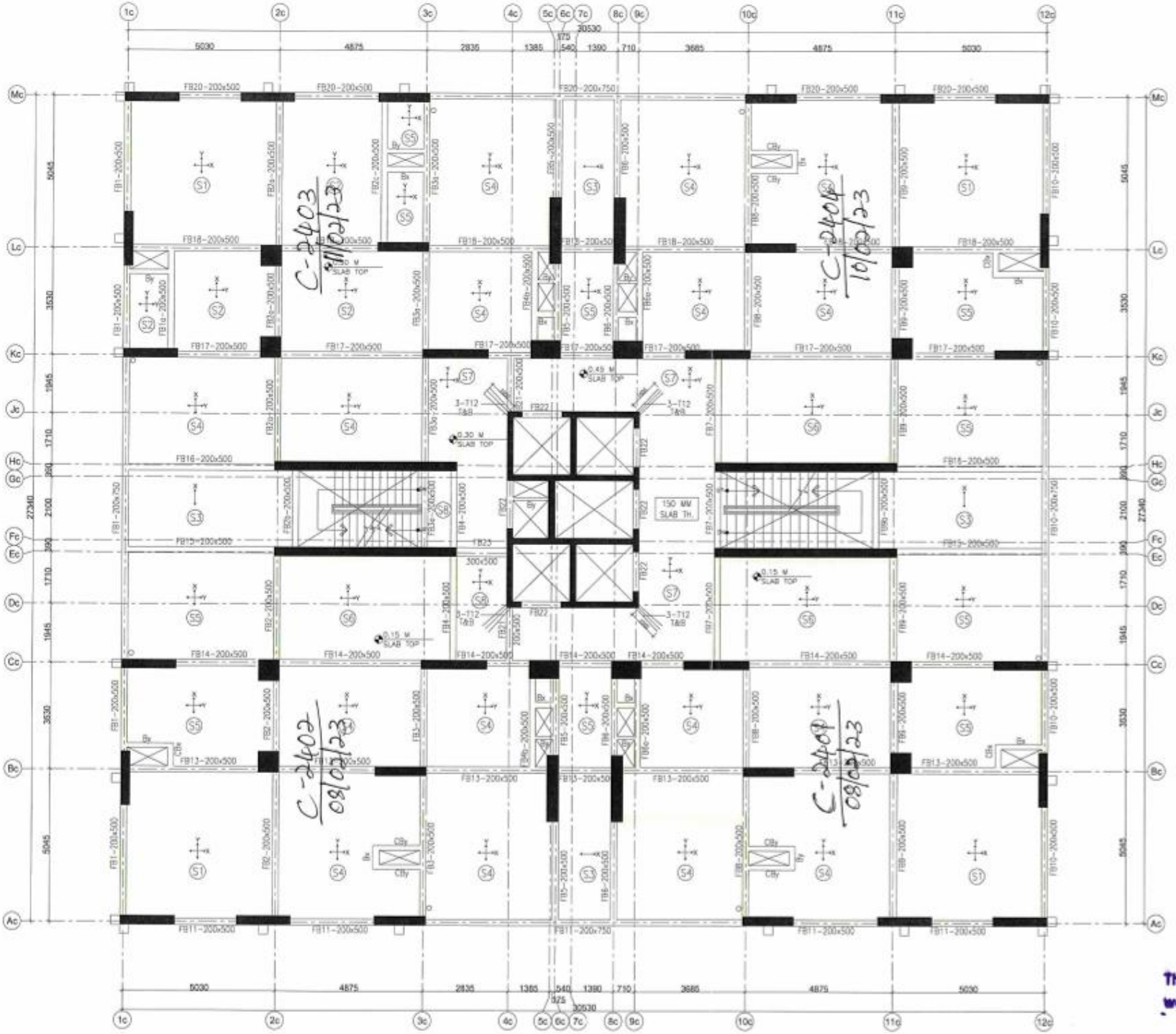

TOWER-C TWENTY SECOND FLOOR

Chethan
(CHETHAN. H.R)

The Measurements on this page were taken on .....



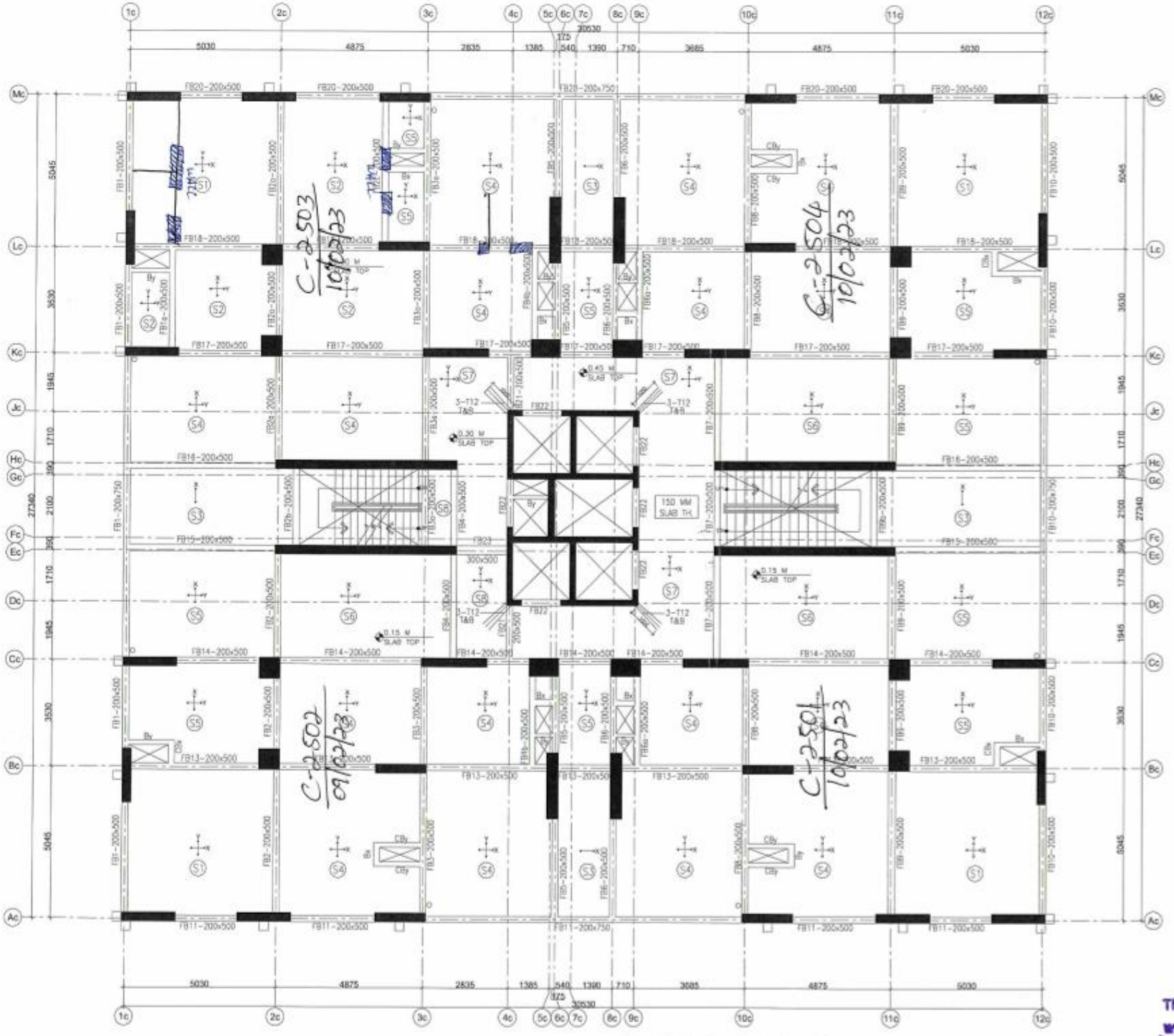

TOWER-C TWENTY THIRD FLOOR




(CHETHAN.H.R)

The Measurements on this page were taken on ..... Compared

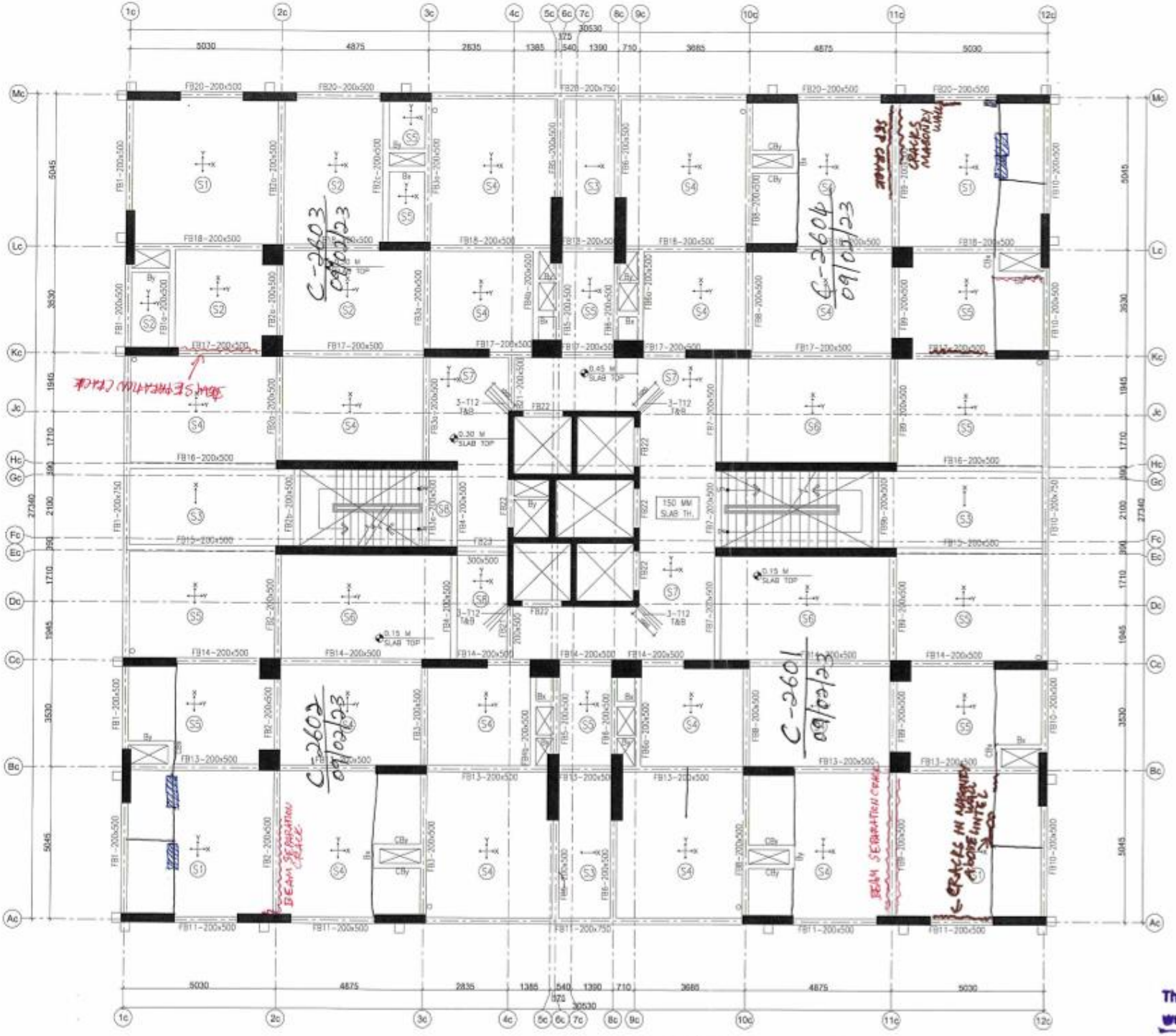
TOWER-C TWENTY FORTH FLOOR




TOWER-C TWENTY FIFTH FLOOR

(CHETHAN.H.P)

The Measurements on this page were taken on 18/2




TOWER-C TWENTY SIXTH FLOOR

Rathod (CHETHAN. H.R)

The Measurements on this page were taken on .....09/02/23.....

19/01/2023, Thursday

Basement Floor - Tower B & C Physical Observations

* Dampness / Ramp Patches / Peeling of Paint were observed in RC Wall, RC Slab, RC beams & Columns at Various locations
* Patch Work / Restoration treatment was done to some of the RC members at Isolated locations.
* Severe Corrosion Cracks / Spalling of cover Concrete / Exposure of rebars were observed in Various locations at RC Wall, RC Slab, RC beams & Columns.
* Shuttering Ply was not removed in RC Slab. b/w Grid Rd-Sd / 5d-6d.
* Oozing of Water was observed in RC Retaining Wall at Isolated locations.

UPVT (Basement Floor) 20/01/23

(SLAB)

1) ~~Ma-La - Mb-Lb~~
3b-4b | Mb-Lb

+60 +62 +77 +59 +63 +
+61 +69 +75 +64 +65 +
+60 +72 +87 +84 +70 +
+62 +68 +73 +61 +61 + 300
+61 +71 +70 +74 +77 +
+72 +70 +64 +75 +75 +
~~+300~~

Indirect method

2) Beam. ~~1B~~ 1b/Lb/Kb P2 = 300 (Direct)

+96 +101 +96 +92 +93 +95 +92 +95
+88 +92 +87 +90 +89 +88 +88 +89

96 +88

+100 +91 +91 +92
+90 +88 +86 +88

3) Beam - ~~1B~~ Mb/1b-2b (Direct) PL = 350mm

90 +98 +102 +88 +84 +84 +85 +85 +91 +87 +83
91 +92 +118 +85 +90 +105 +110 +32 +130 +255 +134

Jaffar
(Jaffar. H.R)
ELITE

01

20/01/2023

Beam - 2b/Mb-2b

PL = 220mm (Direct)

55 + 55 + 55 + 60 + 54 + 55 + 54 + 54

Column - Mb-1b

P2 = 400 (Direct)

+101 + 109 + 110 + 103 102

109 + 113 + 110 + 101 +

+104 + 105 + 110 + 109 + 103

+108 + 115 + 109 + 115 + 117

+111 + 99 + 115 + 112 + 109

+107 + 107 + 116 + 106 + 108

+109 + 103 + 104 + 108 + 115

+109 + 105 + 107 + 102 + 104

+106 + 100 + 103 + 108 + 105

Kethan
(KETHAN.H.P)
SVITL



20/01/2023

(6) Beam. Mb/5b-10b (Direct)

P2 = 350mm

+124 + 93 + 91 + 86 + 86 + 85 + 86 + 86 + 89 + 89 + 86 +

+ 85 + 85 + 91 + 91 + 89 + 88 + 88 + 92 + 96 +

+84 + 87 + 86 + 84 + 85 + 87 + 89 + 86 + 84 + 84 + 86 + 83 + 84 +

+88 + 89 + 92 + 90 + 90 + 86 + 90 + 86 + 88 + 87 + 86 + 85 +

+83 + 86 + 85 + 88 + 85 + 84 + 80 + 86

+83 + 84 + 81 + 106 + 86 + 84 + 84 + 85

+86 + 86 +

+86 + 86

Kethan
(KETHAN.H.P)
SVITL

Shear Wall 3b/Mb-Lb PL - 380 Direct 20/01/2023

+90 + 92 + 89 + 85 + 81 + 92 + 92 + 91 + 91 + 89 + 85 +
95 + 88 + 88 + 86 + 81 + 86 + 56 + 80 + 85 + 83 + 79 + 79
89 + 87 + 88 + 84 + 83 + 81 + 85 + 82 + 84 + 79 + 79 + 75
93 + 86 + 86 + 86 + 82 + 79 + 81 + 82 + 89 + 84 + 81 + 79
75 + 89 + 91 + 101 + 83 + 82 + 83 + 81 + 81 + 83 + 84 + 78
86 + 84 + 83 + 84 + 84 + 83 + 88 + 87 + 88 + 84 + 38 + 77
82 + 78 + 83 + 82 + 86 + 92 + 92 + 88 + 88 + 88 + 83 + 82
88 + 85 + 82 + 82 + 80 + 84 + 87 + 88 + 91 + 78 + 82 + 86
80 + 80 + 78 + 81 + 81 + 85 + 91 + 87 + 86 + 86 + 82 + 79
4 + 81 + 85 + 80 + 82 + 84 + 81 + 84 + 87 + 81 + 78 + 78
9 + 82 + 79 + 79 + 75 + 77 + 75 + 81 + 82 + 77 + 76 + 79

Kathan
(CHETHAN .B.R)
BUIPL



21/01/2023

8) Beam - 2b/3b-5b (Direct)

PL = 230 mm

+120 +59 +56 +57 +57 +59 +57 +56 +56 +57 +58 +69

9) Column - 2b/8b-9b (Direct PL = 440 mm x 1085 mm

+111 + 111 + 108 + 112 + 113 + 114
+94 + 105 + 111 + 111 + 108 + 117
+104 + 108 + 128 + 114 + 109 + 112
+114 (185) + 123 + 124 + 119 + 116 + 114
+112 + 120 + 119 + 115 + 111 + 120
+121 + 120 + 118 + 124 + 110 + 122
+117 + 118 + 117 + 119 + 118 + 113
+111 + 120 + 116 + 118 + 116 + 116
+109 + 116 + 117 + 113 + 114 + 117
+101 + 117 + 113 + 116 + 118 + 112
+110 + 113 + 110 + 109 + 111 + 108

21/01/2023

(10) Beam - 2b/8b-10b Direct

P2 = 230

+91 + 58 + 58 + 57 + 55 + 56 + 55 + 53

(11) Slab - 2b/4b-8b/10b DL: 300mm

(INDIRECT)

+55 + 72 + 66 + 75 + 78 +

+51 + 67 + 63 + 72 + 77 +

+50 + 87 + 67 + 78 + 76 +

+57 + 66 + 66 + 72 + 65 +

+51 + 72 + 78 + 71 + 87 +

+68 + 70 + 70 + 63 + 77 +



21/01/2023

(12) Column - 12b - 1b Direct Method

P2 = 440 x 1440 mm

+112 + 112 + 113 + 118

+106 + 108 + 114 + 103

+106 + 118 + 108 + 101

+114 + 119 + 106 + 109

+106 + 107 + 107 + 106

+108 + 118 + 107 + 106

+110 + 107 + 115 + 108

+107 + 108 + 109 + 104

+110 + 119 + 114 + 106

+112 + 109 + 113 + 112

+123 + 113 + 112 + 96

(13) Slab → 1b/1b-2b Indirect DL = 200

+77 + 75 + 74 + 89 + 85 + 85 + 76 + 90

+92 + 82 + 78 + 88 + 80 + 72 + 83 + 77

+85 + 94 + 102 + 98 + 81 + 94 + 87 + 112

+93 + 93 + 92 + 78 + 85 + 90 + 89 + 81

+93 + 95 + 85 + 76 + 96 + 93 + 83 + 83

(4) Column – kb/36-46 Direct

21/01/2023

PL = 340 X 2030 mm

| | | | | | |
|---|---|---|---|---|---|
| +90 | +86 | +87 | +87 | +89 | +89 |
| +96 | +90 | +91 | +90 | +89 | +89 |
| +94 | +91 | +86 | +89 | +89 | +90 |
| +87 | +90 | +85 | +87 | +89 | +87 |
| +93 | +90 | +90 | +96 | +94 | +94 |
| +94 | +96 | +92 | +95 | +96 | +97 |
| +93 | +92 | +87 | +93 | +88 | +87 |
| +88 | +89 | +86 | +89 | +86 | +84 |
| +87 | +88 | +87 | +89 | +84 | +87 |
| +143 | +130 | +148 | +136 | +131 | +98 |
| +112 | +100 | +97 | +98 | +117 | +109 |

(15) Column – kb – 11b direct

PL = 430mm

| | | | |
|---|---|---|---|
| 128 | 124 | 124 | 126 |
| 124 | 122 | 118 | 117 |
| 121 | 118 | 111 | 115 |
| 124 | 124 | 118 | 118 |
| 120 | 111 | 118 | 117 |
| 117 | 115 | 114 | 114 |
| 113 | 113 | 114 | 115 |

| | | | |
|---|---|---|---|
| +115 | +111 | +104 | +110 |
| +108 | +106 | +105 | +107 |
| +112 | +110 | +105 | +107 |
| +104 | 104 | +104 | +115 |

(16) Column – kb/8b-9b Direct

21/01/2023

PL = 690 X 1030mm

| | |
|---|---|
| +248 | +249 |
| +250 | +255 |
| +280 | +288 |
| +259 | +255 |
| +254 | +282 |
| +247 | +252 |
| +247 | +238 |
| +242 | +238 |
| +234 | +238 |

21/01/2023

(17) Column – Cb/12b Direct

PL = 450 mm.

+138 +121 +120 +127
+114 +117 +119 +128
+110 +109 +114 +122
+109 +107 +109 +113
+107 +108 +111 +120
+108 +112 +121 +121
+109 +113 +115 +121
+110 +108 +113 +120
+111 +108 +120 +123
+113 +110 +141 +134
+127 +110 +119 +127
+103 +114 +118 +113



TOWER-B

23/01/2023

(18) Slab – Cb, Db – 11b, 12b (Indirect)

PL = 300 Indirect

+120 +149 +113 +81 +94
+85 +112 +279 +100 +857
+83 +82 +83 +77 +59 +
+76 +82 +84 +85 +72 +
+95 +81 +82 +73 +784
+71 +79 +109 +107 +84+

RHT

| | | |
|---|---|---|
| 54 | 52 | 50 |
| 48 | 52 | 54 |
| 52 | 54 | 51 |

23/01/2023

(19) Column → Cb – 10b Direct

P2 = 340 x 2040 mm

+97 +94 +98 +99 +107 +95
+88 +85 +91 +89 +93 +93
+96 +92 +91 +92 +95 +92
+89 +85 +89 +90 +93 +91
+99 +105 +90 +94 +92 +94
+89 +87 +88 +85 +89 +86
+92 +89 +86 +88 +83 +85
+81 +87 +85 +86 +91 +98
+83 +84 +83 +84 +86 +84
+79 +81 +81 +85 +84 +89
+89 +84 +83 +87 +83 +87
+80 +83 +87 +88 +87 +88



23/01/2023

(20) Column → B6/86-96 Direct P2 = 2430 x 1860 mm

+112 +116 +111 +113 +115 +112
+109 +107 +109 +105 +106 +104
+110 +106 +106 +108 +105 +110
+109 +109 +106 +108 +109 +114
+111 +111 +104 +111 +118 +118
+112 +111 +105 +108 +111 +112
+112 +110 +102 +109 +111 +112
+117 +110 +104 +109 +116 +109
+111 +109 +102 +108 +109 +111
+113 +112 +105 +106 +108 +110
+110 +109 +108 +112 +110 +111
+136 +120 +147 +110 +164 +110

(21) Slab → ~~Bb/96-10b~~ Endirect P2 = 300 mm
(Ab Bb/96-10b)

+78 +78 +84 +77 +61
+64 +68 +70 +81 +73
+56 +72 +75 +78 +60
+80 +62 +79 +96 +82
+70 +77 +78 +78 +71
+63 +84 +75 92 +100

(22) RHT

54, 56, 54, 52, 50
54, 54, 54, 52, 50
50, 54.

23/01/2023

(23) Column → Mb / 11b  Direct  PL = 835 mm

+ 152 + 119 + 88 + 88
+ 130 + 100 + 101 + 90 + 82
+ 98 + 97 + 93 + 96 + 86 + 94
+ 97 + 98 + 95 + 90 + 82 + 90
+ 94 + 97 + 93 + 90 + 86 + 98
+ 97 + 96 + 92 + 91 + 98 + 94
+ 95 + 96 + 93 + 88 + 97 + 98
+ 96 + 97 + 92 + 94 + 100 + 96
+ 93 + 97 + 100 + 113 + 121 + 119

Column - 11b / Lb  Direct  PL = 680

+ 202 + 203 + 204 +
+ 214 + 200 + 204
+ 207 + 209 + 209
+ 211 + 209 + 219
+ 212 + 206 + 206
+ 207 + 208 + 205
+ 195 + 205 + 203
+ 209 + 260 + 255
+ 208 + 272 + 206
+ 210 + 194 + 210



23/01/2023

(25) Column → Lb / Mb - 10b  PL = 300 × 3800 mm

PL = 300 (Direct)

+ + 83 + 84 + 84 + 88 + 89 + 82 + 75 + 79 + 84 + 79
+ + 84 + 85 + 83 + 89 + 83 + 88 + 84 + 82 + 84 + 85 + 80
+ + 82 + 86 + 82 + 84 + 82 + 86 + 82 + 80 + 83 + 84 + 82
+ + 84 + 85 + 84 + 84 + 83 + 83 + 77 + 80 + 86 + 83 + 80
+ ab + 89 + 90 + 85 + 82 + 80 + 87 + 80 + 81 + 86 88 + 80
+ 87 + 88 + 88 + 80 + 85 + 82 + 87 + 85 + 74 + 83 + 79 + 81
+ ab + 85 + 87 + 82 + 87 + 85 + 88 + 83 + 85 + 81 + 80 + 79 + 81
+ ab + 88 + 83 + 83 + 82 + 85 + 84 + 83 + 82 + 80 + 82 + 80
+ ab + 84 + 83 + 83 + 83 + 85 + 89 + 81 + 85 + 84 + 81 + 78
+ 90 + 83 + 88 + 84 + 80 + 86 + 85 + 86 + 85 + 83 + 80 + 79
+ 75 + 84 + 89 + 92 + 81 + 85 + 84 + 93 + 90 + 82 + 90 + 88

23/01/2023

(26) Column → kb - lob (Direct)

PL = 330

+91 +89 +83 +84 +82 +90

+90 +90 +88 +83 +86 +89

+81 +89 +89 +86 +87 +92

+91 +90 +94 +90 +92 +90

+82 +86 +88 +88 +85 +90

+82 86+ 82+ 86 + 87 + 82 +81

+78 +85 +83 +80 +86 +87

+78 +81 +83 +83 +79 +83

+76 +82 +84 +82 +80 +82

+79 + db + db + db + db + db

+90 +91 +92 +121 +243 + db

db



23/01/2023

(27) Column → kb/5b Direct

PL = 1030 mm.

+244 +250

+249 +255

+249 +256

+262 +248

+277 +266

+264 +268

+261 +266

+256 +253

+255 +256

+248 +250

+250 +264

28 Column → Mb/2b Direct

23/01/2023

P2 = 340mm

+ + 92 + 93 + 90 + 86 + 87

+ + 90 + 90 + 93 + 82 + 86

+ 93 + 92 + 91 + 89 + 84 + 85

+ 100 + 92 + 94 + 96 + 86 + 89

+ 97 + 93 + 99 + 93 + 84 + 95

+ 97 + 91 + 98 + 95 + 83 + 86

+ 97 + 91 + 95 + 92 + 85 + 88

+ 93 + 92 + 96 + 94 + 97 + 101



29 Column → 2b/1b Direct

23/01/2023

P2 = 440 mm

+ 124 + 124 + 130 + 131

+ 119 + 120 + 116 + 116

+ 124 + 119 + 117 + 115

+ 121 + 123 + 124 + 124

+ 124 + 119 + 111 + 119

+ 130 + 126 + 123 + 120

+ 126 + 122 + 112 + 120

+ 126 + 124 + 119 + 132

+ 128 + 130 + 149 + 139

+ 140 + 141 + 144 + 142

23/01/2023

(30) Slab → 2b/Mb – 8b/10b

RHT

| | | |
|---|---|---|
| 54 | 58 | 52 |
| 52 | 52 | 50 |
| 48 | 52 | 54 |

(31) Slab → 2b/1b-2b

RHT

| | | |
|---|---|---|
| 50 | 54 | 50 |
| 52 | 48 | 50 |
| 48 | 50 | 52 |



23/01/2023

(32) Column → 8b – 9b Direct

PL = 1030mm

+248 +249

+246 +255

+257 +249

+248 +246

+264 +266

+270 +269

+260 +260

+260 +255

+254 +259

+257 +257

+250 +250

23/01/23

(33) Column → cb - 5b  Direct

P2 = 690

| | | |
|---|---|---|
| + 165 | + 171 | + 132 |
| + 173 | + 177 | + 172 |
| + 170 | + 173 | + 172 |
| + 171 | + 170 | + 176 |
| + 175 | + 174 | + 178 |
| + 170 | + 173 | + 174 |
| + 176 | + 173 | + 177 |
| + 177 | + 173 | + 178 |
| + 193 | + 192 | + 174 |
| + | + | + |



24/01/2023

(34) Column - 10b / Ab - Bb (Direct)

P2 = 290mm

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| + | + | 75 | + 76 | + 77 | + 74 | + 78 | + 78 | + 100 | + 98 | + 86 | + 85 | + 82 |
| + | + | 76 | + 77 | + 77 | + 76 | + 75 | + 78 | + 96 | + 83 | + 78 | + 79 | + 79 |
| + | + | 82 | + 76 | + 76 | + 75 | + 81 | + 78 | + 73 | + 77 | + 76 | + 76 | + 78 |
| + | + | 83 | + 82 | + 81 | + 75 | + 77 | + 78 | + 74 | + 78 | + 76 | + 77 | + 80 |
| + | 79 | + 78 | + 81 | + 78 | + 78 | + 82 | + 77 | + 74 | + 77 | + 74 | + 77 | + 80 |
| + | 74 | + 77 | + 83 | + | + | + 90 | + 80 | + 78 | + 76 | + 76 | + 78 | + 76 |
| + | 73 | + 75 | + 76 | + 76 | + 76 | + 77 | + 75 | + 77 | + 75 | + 74 | + 78 | + 86 |
| + | + | + | + 77 | + 75 | + 76 | + 70 | + 76 | + 74 | + 74 | + 76 | + 76 | + 80 |
| + | + | + | + | + | + | + | + 77 | + 76 | + 75 | + 72 | + 77 | + 80 | + 82 | + 81 |
| + | 77 | + 89 | + 81 | + 75 | + 73 | + 76 | + 73 | + 77 | + db | + db | + 82 | + 84 |
| + | 182 | + db | + db | + db | + dp | + db | + dp | + db | + dp | + db | + dp | + dp | + dp | + db |

(35) Beam - Ab/9b-10b Direct



(36) Shear wall (column) → 3b/Ab-Bb 24/01/2023

(Direct) PL = 280 mm

+ 94 + 90 + 94 + 90 + 95 + 89 + 80 + 77 + 83 + 75 + 76 + 78

+ 82 + 93 + 90 + 88 + 92 + 83 + 81 + 76 + 74 + 75 + 79 + 81

+ 87 + 88 + 87 + 86 + 89 + 84 + 79 + 79 + 76 + 76 + 71 + 76

+ 82 + 81 + 83 + 84 + 84 + 82 + 82 + 84 + 80 + 81 + 77 + 78

+ 86 + 96 + 94 + 92 + 86 + 88 + 84 + 87 + 86 + 84 + 84 + 85

+ 84 + 85 + 87 + 88 + 87 + 88 + 89 + 90 + 84 + 74 + 80 + 82

+ 80 + 84 + 86 + 84 + 85 + 83 + 89 + 86 + 78 + 81 + 87 + 76

+ 80 + 82 + 79 + 167 + 45 + 81 + 95 + 89 + 85 + 79 + 77 + 74

+ 110 + 112 + 110 + 120 + 109 + 86 177 + 105 + 83 + 84 + 83 + 77 + 76

+ 120 + 120 + 120 + 160 + 160 + 157 + 110 + 85 + 80 + 75 + 78 + 81

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7) RC column – 11b/Bb

PL = 790 mm
Direct

| | | |
|---|---|---|
| + 217 | + 350 | + 267 |
| + 201 | + 183 | + 290 |
| + 185 | + 187 | + 208 |
| + 185 | + 193 | + 189 |
| + 206 | + 209 | + 208 |
| + 208 | + 204 | + 208 |
| + 211 | + 206 | + 207 |
| + 206 | + 200 | + 205 |
| + 200 | + 202 | + 201 |
| + 203 | + 198 | + 199 |
| + 198 | + 186 | + 187 |



(38) col – 12b / Ab
(Dead, PL = 410)

| | |
|---|---|
| + 124 | + 126 |
| + 120 | + 116 |
| + 114 | + 110 |
| + 99 | + 103 |
| + 100 | + 100 |
| + 97 | + 101 |
| + 100 | + 101 |
| + 113 | + 116 |
| + 114 | + 110 |

(39) col – 12b / Ab (PL = 480) 24/01/2023

| | |
|---|---|
| + 124 | + 121 |
| + 124 | + 130 |
| + 124 | + 123 |
| + 122 | + 120 |
| + 120 | + 118 |
| + 117 | + 114 |
| + 119 | + 111 |
| + 113 | + 104 |
| + 107 | + 112 |

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(40) column - Kb/12b
(Pl - 450)

+123 +127 +125 +122
+122 +120 +123 +118
+119 +120 +129 +105
+125 +129 +120 +112
+126 +124 +129 +123
+109 +109 +120 +112
+110 +107 +109 +106
+113 +110 +106 +104
+126 +129 +126 124
+121 +122 +118 +110
+116 +120 +109 105
+109 +111 +109 +106

(41) col Lb/12b
(Pl - 450)

+ + + +
+ + + +
+ db +db +123 +121
+ 254 + db + 219 + 127
+ db + db + 100 + 138
+ 119 + 160 + 113 + 121
+ 103 + 111 + 112 + 112
+ 105 + 111 + 114 + 112
+ 103 + 103 + 109 + 110
+ 113 + 110 + 111 + 105
+ 101 + 106 + 107 + 111
+ 98 + 106 + 106 + 104

(42) Mb/12b - RC colums

DNet, PL = 390 mm

+ + + +
+ 98 + db + db + 124
+ 124 + 113 + db + 108
+ 95 + 114 + 108 + 103
+ 97 + 134 + 91 + 102
+ 180 + 129 + 115 + 121
+ 111 + 128 + 102 + 97
+ 105 + 98 + 110 + 123

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Lb/126-116

(13) Slab Kb/116-126

(Pl-300x300)

+104 +111 +115 +111 +107 +

+90 +111 +93 +107 +115 +

+86 +73 +91 +92 +93 +

+77 +94 +88 +96 +95 +

+89 +81 +100 +99 +111 +

+98 +110 +111 +104 +106 +

(14) Slab ~~Lb/Mb~~ Lb-Mb/116-126

(Pl-300)

+93 +59 +88 +83 +56 +

+69 +83 +91 +84 +56 +

+80 +70 +65 +71 +52 +

+72 +80 +77 +80 +52 +

+76 +81 +69 +74 +66 +

+76 +80 +73 +90 +84 +





(45) Beam - Kb/116-126

(Pl-~~200~~)

+56+62+61 +57 +57 +58 +57 +57 +60 +60

(46) Beam - Mb/116-126

(Pl-340)

+123 +125 +94 +97 +96 +93 +92 +105 (DB) +206 (DB)

+97 +100 +92 +97 +94 +100 (DB) +111 (DB) +106 (DB) +219 (DB)

(47) Beam. Gb-Hb/116-126

(Pl-230)

+59 +61 +59 +60 +59 +60 +61 +60 +60 +58 +57 +57 + 58 + 56

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(48) Beam A6/116-126
(P1-360)

38 + 92 + 88 + | Beam | + 90 + 90 + 91 + 89 + 99
11 + 88 + 94 + + 90 + 88 + 84 + 84 + 85 + 83

(49) Beam A6/106-116
(P1 - (~~P1~~-360)

+104 +103 +104 + 104 + 103 + 112 + 109 + 109 +
+101 + 101 + 106 + 103 + 103 + 99 + 102 + 108 +

(50) Beam A6/106-86
(P1-360)

93 + 104 + 106 + 101 + 97 + 105 + 104 + 105 + 108 + 120 + 124 + DB + 132 + 120 + 108 + 104 + 105 + 118 + 113 + 108 +
136 + 138 + 143 + 163 + 138 + 224 DB + 187 + 319 DB + DB + DB + DB + DB + DB + 294 DB + DB + 206 + 78 + 75 +

(30)

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(51) Beam A6/76-86
(P1-360)

102 + 103 + 101 + 112 + 106 + 104 + 117 + 134 + 136 +
108 + 114 + 109 + 101 + 130 + 157 + 133 + 164 + 3454
140 DB DB

(52) Column B6/56 (P1-440)

+107 +106 +109 +106 +103 +109
+104 +104 +107 +105 +107 +112
+107 +112 +113 +117 +110 +134
+116 +117 +105 +107 +112 +119
+109 +112 +108 +103 +105 +107
+109 +107 +102 +104 +106 +111
+114 +116 +108 +107 +109 +109
+111 +116 +109 +110 +111 +110
+112 +117 +112 +110 +121 +116
+140 +120 +122 +129 +130 +113

(33)

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(53) Column C6/16 (Pl-430)

+118 +121 +119 +121 +120

+109 +107 +107 +109 +106

+109 +111 +109 +109 +108

+110 +109 +110 +111 +119

+109 +111 +113 +115 +112

+108 +106 +111 +112 +110

+111 +107 +111 +110 +112

+107 +106 +108 +110 +111

+102 +105 +112 +109 +110

+102 +103 +106 +107 +107

+101 +102 +102 +124 +124

(54) Beam ~~16/A6-C6 (Pl-330)~~ (34)

+ + +85+86+82+81+82+97+104+82+84+84+82+

+ + +82+82+83+83+90+105+81+79+83+82+

24/01/2023

150.1 X 150.8 X 150.1 = 8.073 = 451 =

150.3 X 150.5 X 150.6 = 8.154 = 458 =

150.6 X 150.4 X 151.3 = 8.257 = 463 =

1) 22.635 = 451 = 19.9

2) 22.620 = 458 = 20.29

3) 22.650 = 463 = 20.40

(54) Beam: 16/A6-C6 (Pl-380)

97 84 84 91 94 84 85 86 82 81 82 97 104 82 84 84 82

+ + + + + + + + + + + + + + + +

+ + + + + + + + + + + + + + + +

141 127 124 99 92 84 82 90 82 83 83 90 105 81 79 83 82

DB DB DB

(35)

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Column A6/16 (Pl-390)

+89 +90 +98 +94 +98

+104 +111 +108 +113 +105

+97 +107 +104 +98 +101

+101 +103 +104 +114 +102

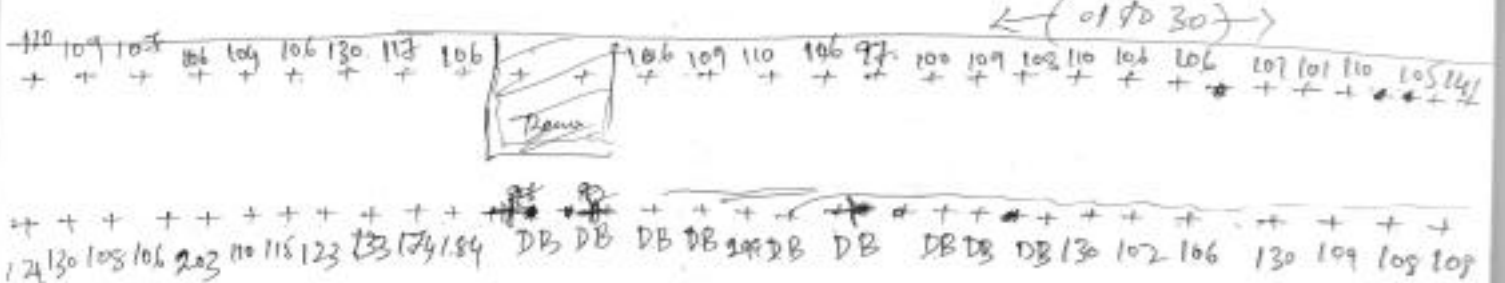
+106 +108 +219 +106 +97
DB

+104 +211 +294 +126 +138
DB DB

+ + +237 +230 +123

+ DB DB DB DB

(55) Beam 16/C6-K6 (Pl-360.) 24/01/2023




25/01/2023 (58) Beam 26/H6-K6 (Pl-230)

(28) (29) (30)

+99 +98 +106

+103 +104 + DB

+61 +60 +58 +59 +59 +58 +54 +54 +56 +55

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(57) Column A6/26.(340-P1)

| | | | |
|---|---|---|---|
| +83 | +99 | +97 | +95 |
| +82 | +91 | +103 | +95 |
| +88 | +97 | +98 | +104 |
| +95 | +93 | +92 | +95 |
| +100 | +96 | +94 | +96 |
| +98 | +137 | +343 (DB) | +344 (DB) |
| +115 | +98 | +106 | +196 DB |



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(59) Beam K6/26-36 (P1-220)

+58 +57 +58 +59 +58 +55 +53

(60) Column A6/11.(P1-350)

| | | | | | | |
|---|---|---|---|---|---|---|
| +87 | +90 | +86 | +84 | +91 | +96 | +129 DB |
| +92 | +92 | +98 | +96 | +289 DB | +40 DB | +269 DB |
| +91 | +90 | +89 | +93 | +92 | +93 | +72 |
| +93 | +93 | +92 | +87 | +90 | +86 | +83 |
| +92 | +93 | +91 | +86 | +84 | +84 | +81 |
| +95 | +92 | +99 | +86 | +98 | +92 | +81 |
| +100 | +92 | +95 | +94 | +96 | +102 | +96 |

25/01/2023

Block 'B'

(62) Shear wall - E6 / 106-116

Indirect (Pl-300)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3.70 | 3.75 | 3.41 | 3.00 | 3.26 | 3.19 | 3.40 | | | |
| +81 | +80 | +88 | +100 | +92 | +94 | +88 | | | |
| 3.33 | 3.06 | 3.03 | 3.06 | 3.03 | 3.00 | 3.00 | | | |
| +90 | +98 | +99 | +98 | +99 | +100 | +100 | | | |
| 3.06 | 3.03 | 2.83 | 2.85 | 2.97 | 3.09 | 3.09 | | | |
| +98 | +99 | +106 | +105 | +101 | +97 | +97 | | | |
| 2.85 | 3.06 | 3.09 | 3.06 | 2.83 | 2.97 | 3.19 | | | |
| +104 | +98 | +97 | +98 | +106 | +101 | +94 | | | |
| 3.00 | 3.03 | 3.09 | 3.09 | 3.03 | 3.06 | 3.03 | | | |
| +100 | +99 | +97 | +97 | +99 | +98 | +99 | | | |
| 3.19 | 3.26 | 3.00 | 3.13 | 3.06 | 3.06 | 3.00 | | | |
| +94 | +92 | +100 | +96 | +98 | +98 | +100 | | | |
| 3.41 | 3.03 | 3.06 | 2.94 | 3.03 | 3.13 | 3.19 | | | |
| +88 | +99 | +98 | +102 | +99 | +96 | +94 | | | |
| 3.75 | 2.94 | 3.06 | 3.19 | 3.03 | 3.00 | 3.03 | | | |
| +80 | +102 | +98 | +94 | +99 | +100 | +99 | | | |
| 3.94 | 3.13 | 3.48 | 3.57 | 3.19 | | | | | |
| +76 | +96 | +86 | +84 | +94 | | | | | |

(41)

(61) Shear wall - H6 / 36-46 (Pl-330) Dirict.

Dirict ↓ (Indirect - Pl-300)

| | |
|---|---|
| 96 + 83 + 80 + 84 + 95 + 89 + 94 + 98 + | + 81 + 74 + 84 + 84 + 83 + 80 + 77 + 82 + 81 + |
| 91 + 83 + 87 + 91 + 86 + 90 + 91 + 93 + | + 90 + 78 + 89 + 88 + 85 + 87 + 91 + 77 + 79 + |
| 89 + 85 + 90 + 92 + 92 + 91 + 92 + 95 + | + 87 + 81 + 86 + 84 + 82 + 88 + 92 + 85 + 91 + |
| 99 + 98 + 99 + 100 + 94 + 100 + 98 + 101 + | + 79 + 88 + 94 + 90 + 88 + 84 + 86 + 92 + 84 + |
| 90 + 91 + 91 + 94 + 96 + 99 + 97 + 101 + | + 85 + 101 + 92 + 101 + 98 + 89 + 94 + 98 + 90 + |
| 89 + 90 + 89 + 94 + 93 + 91 + 92 + 100 + | + 89 + 96 + 92 + 85 + 84 + 79 + 89 + 99 + 100 + |
| 86 + 87 + 88 + 97 + 93 + 94 + 96 + 97 + | + 101 + 84 + 101 + 89 + 103 + 90 + 90 + 98 + 102 + |
| 95 + 92 + 93 + 92 + 91 + 98 + 99 + 104 + | + 87 + 83 + 91 + 87 + 85 + 83 + 86 + 94 + 98 + |
| 94 + 94 + 91 + 96 + 92 + 90 + 89 + 101 + | + 99 + 100 + 77 + 78 + 81 + 82 + 93 + 94 + 92 + |

(40)

Block - 'C' 25/01/2023

7) column - Kc / 12c. (Pl-350)

| | | | | |
|---|---|---|---|---|
| +97 | +96 | +98 | +98 | +95 |
| +107 | +100 | +95 | +99 | +103 |
| +107 | +103 | +102 | +104 | +101 |
| +100 | +102 | +99 | +102 | +108 |
| +106 | +105 | +98 | +108 | +100 |
| +106 | +102 | +109 | +108 | +116 |
| +108 | +93 | +103 | +101 | +104 |
| +106 | +108 | +103 | +103 | +107 |
| +108 | +106 | +108 | +110 | +101 |
| +101 | +101 | +104 | +113 | +111 |
| +109 | +114 | +101 | +103 | +104 |





(13) column-kc/11c (Pl-740)

| | |
|---|---|
| +197 | +201 |
| +197 | +202 |
| +201 | +198 |
| +207 | +212 |
| +219 | +211 |
| +209 | +207 |
| +207 | +207 |
| +223 | +221 |
| +199 | +212 |
| +194 | +203 |
| +183 | +178 |

(14) column 12c/11c (Pl-740.)

| | |
|---|---|
| +181 | +187 |
| +187 | +185 |
| +188 | +202 |
| +188 | +196 |
| +200 | +198 |
| +201 | +188 |
| DB +259 | +205 |
| +187 | +184 |
| +186 | +184 |
| DB +591 | +950 DB |
| +214 DB | +213 DB |

Basement

25/01/2023

Column - 12C/MC
(P1-350)

+102 +103 +104 +99 +98

+102 +109 +108 +109 +108

+103 +102 +83 +99 +105

+84 +85 +83 +85 +84

+87 +86 +84 +80 +81

+87 +91 +87 +84 +85

+90 +89 +83 +79 +85

+86 +85 +83 +81 +90

+87 +90 +78 +90 +86

(16) Column MC/NC
(P1-340)

+99 +96

+93 +95

+101 +98

+92 +95

+97 +93

+94 +93

+105 +93

+86 +92

+113 +83

(44)

Block - 'C' Basement

25/01/2023

(17) Column - 2C/10C (P1-340)

+101 +97 +97 +95 +101 +102

+98 +103 +101 +97 +100 +103

+106 +102 +96 +103 +104 +102

+107 +111 +104 +105 +104 +103

+110 +103 +101 +101 +105 +109

+100 +102 +100 +98 +99 +98

+107 +98 +103 +98 +99 +101

+106 +104 +93 +97 +92 +100

+102 +100 +97 +95 +98 +103

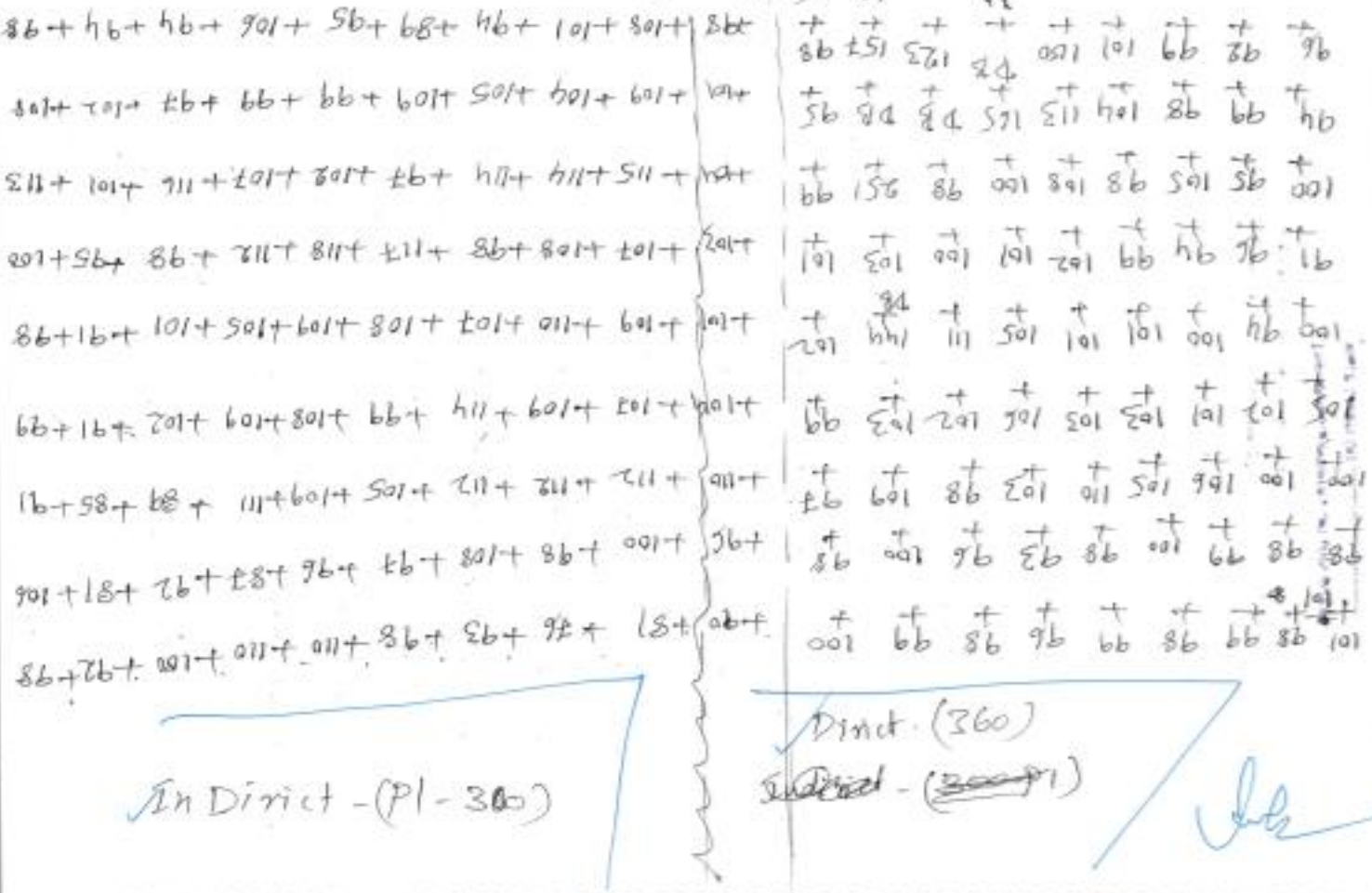
+101 +99 +94 +94 +98 +99

(45)

25/01/2023

(20) Shear wall Ec-Fc/10c-11c

(Pl - 360)



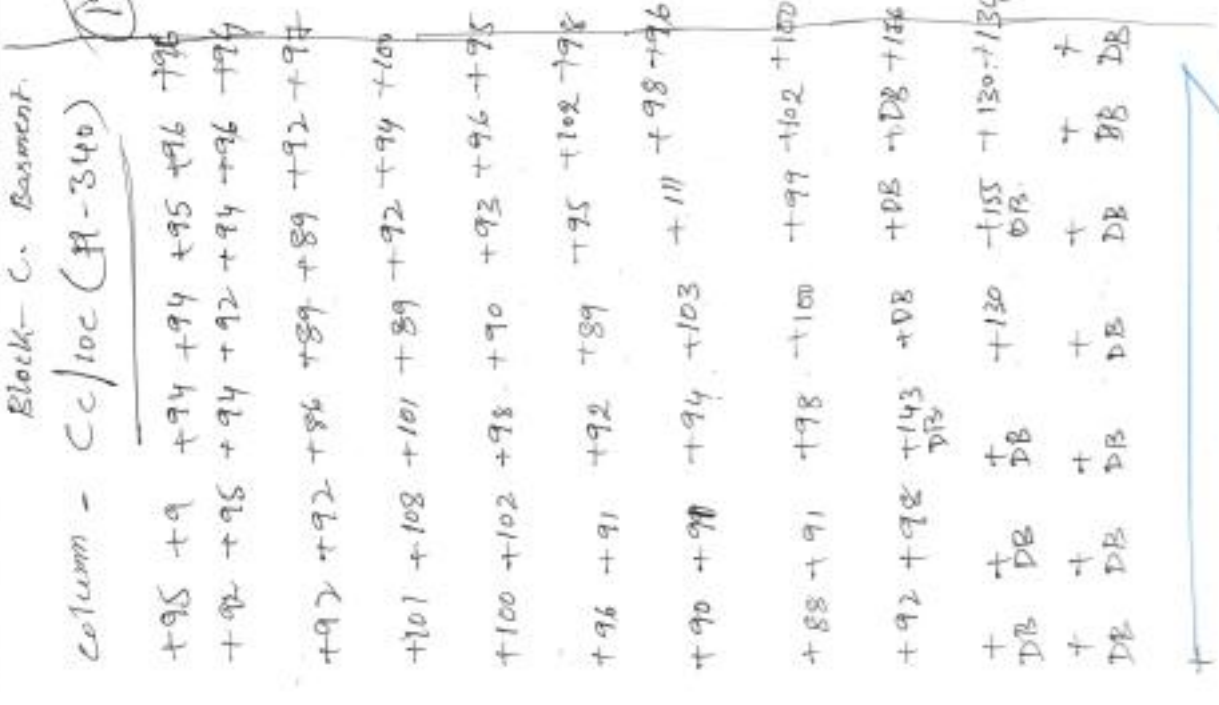

(19) Column - Cc/8c-9c (Pl-1050)

+173 +227
+291 +309
+287 +189
+287 +306
+288 +208
+280 +291
+300 +297
+289 +288
+282 +286
+ db + db
+ db + db

(18)

Block - C. Basement

Column - Cc/10c (Pl - 340)



26/01/2023

# Block - 'C'

## Basement

1) Column - Bc/10c (Pl-330)

+101 +108 +101 +93 +
+107 +101 +99 +101 +
+97 +92 +89 +94 +
+102 +94 +95 +99 +
+98 +97 +95 +102 +
+93 +95 +93 +97 +
+90 +88 +91 +92 +
+90 +91 +87 +90 +
+94 +88 +92 +95 +
+DB + DB + DB + DB + DB

+ + + + + 238
DB DB DB DB DB

22) Column - Bc/8c (Pl-430)

+116 +120 +119 +121 +DB +DB + 210
+121 +118 +113 +117 +DB +DB +DB
+114 +113 +118 +116 +DB +DB + DB
+114 +114 +116 +115 +DB +DB + DB
+130 +124 +130 +128 +DB +DB + DB
+128 +128 +128 +127 +DB +251 + 337
DB DB
+119 +120 +121 +126 +436 +DB + DB
DB
+115 +116 +103 +114 +117 +DB + DB
+113 +116 +117 +104 +DB +DB + DB
+112 +107 +109 +110 +DB +DB + DB
+112 +113 +107 +141 +92 +DB + DB
DB

The Measurements on this page were taken on 26/1



26/1/2023

23) Column 5c/Cc (Pl-1040)

+281 + 288
+289 +288
+285 + 289
+295 + 294
+294 + 291
+291 + 287
+300 + 290
+254 + 260

24) Column - Cc/3c-4c (Pl-340)

+101 +104 +108 +109 +106 +102 + 106
+100 +99 +98 +101 +96 + 99 + 102
+96 +97 +97 +95 +92 +93 + 95
+97 +90 +94 +93 +94 + 96 + 97
+100 +98 +95 +92 +99 +101 +103
+97 +97 +93 +104 +100 +96 + 101
+97 +95 +94 +97 +98 +96 + 93
+98 +97 +97 +98 +99 +95 + 99
+103 +100 +92 +98 +97 +96 + 95
+99 +DB +DB +98 +102 +102 + 106
+91 +116 +124 +136 +94 +113 + 167
DB DB

The Measurements on this page were taken on 26/1

Block- C, Basment 26/1/23

(25) column - BC/6C
(Pl-430)

+120 +119 +115 +112 +DB +DB +DB

+117 +118 +118 +119 +DB +DB +239

+118 +115 +112 +119 +DB +DB +148

+120 +110 +111 +DB +DB +DB +DB

~~119~~ 122
~~DB~~ +DB +107 +112 +122 +DB +DB

DB +DB +123 +119 +110 +109 +121

+111 +118 +111 +117 +118 +113 +114

113 +116 +102 +116 +115 +115 +115

DB +DB +DB +152 +110 +104 +114

DB +215 +DB +DB +DB +DB +DB

DB +DB +DB +DB +119 +252 +137
DB

(26) column - AC/12C
(Pl-330)

+96 +95

+97 +92

+99 +95

+94 +99

+101 +95

+95 +90

+104 +103

+179 +135

+130 +131

The Measurements on this page were taken on ...

(50)

Block- C, Basment 26/1/2023

(27) column - BC/10C
(Pl-330)

+121 +108 +104 +102 +106

+98 +104 +98 +99 +102

+92 +98 +90 +90 +89

+93 +98 +97 +96 +102

+96 +97 +96 +97 +101

+87 +90 +94 +91 +96

+90 +85 +87 +85 +92

+94 +89 +92 +88 +90

+104 +92 +88 +87 +96

+DB +DB +DB +DB +DB

+DB +DB +DB +DB +DB

(28) column - CC/11C
(Pl - 760)

+213 +206

+240 +230

+201 +209

+210 +230

+223 +216

+210 +210

+208 +210

+204 +209

+219 +200

+219 +DB

+DB +DB

The Measurements on this page were taken on ...

(51)

Block - C. — Basement

column - AC/10C

(pl - 340)

+101 +96 +89 +119 +90 +98

+111 +109 +85 +90 +94 +95

+96 +90 +85 +86 +93 +89

+111 +DB +120 +91 +82 +111

+DB +130 +129 +88 +98 +DB

+103 +108 +91 +90 +94 +DB 181

+101 +104 +80 +94 +96 +102

+DB +DB +119 +105 +DB +DB

+DB +DB +150 DB +118 +99 +DB

30 column - CC/2C

(pl - 740)

+202 196 +DB 205

+197 +206

+213 +209

+205 +196

+199 +202

+201 +196

+188 +190

+231 +229

+196 +DB





Block - C Basement

31 column - AC/11C

(pl-340)

+84 +86 + +1 +97 +100

+88 +91 + + +98 +96

+DB +DB +95 +94 +89 +94

+121 +139 +110 +108 +DB +DB

+185 +128 +101 +DB 157 +DB 132 +DB

+131 +08 +98 +96 +DB +DB

+102 +DB +DB +DB +DB +DB

+DB +DB +DB +156 DB +DB +DB

+DB +DB 126 +115 +86 +DB +DB

32 column - BC/2C

(pl - BC/2C)

+209 +210

+207 +212

+205 +209

+205 +206

+209 +208

+206 +199

+205 +201

+204 +200

+196 +204

+216 +230

+184 +219

(pl-750)

26/1/23

Column - BC/3C
(Pl = 330)

-90 +98 +101 +86 +95
-88 +91 +98 +91 +96
-91 +90 +91 +86 +93
104 +88 +113 +89 +107
88 +90 +94 +87 +97
83 +93 +90 +83 +93
82 +90 +90 +84 +87
93 +88 +87 +84 +91
85 +87 +87 +88 +116
91 +90 +101 +86 +93
+137 +179 +122 +140 +103
DB DB DB

(34) Column - AC/3C
(Pl - 330)

92+ 89+ +- +97 +95
90+ 93+ +- +98+90
137+ 88+ +115+103
109+ 90+ 94+ 95+ 88+
99+ 87+ 91+ 92+ 106+
88+ 83+ 93+ 94+ 97+
88+ 89+ 120+ 94+ 96+
114+ 132+ 161 +259 + 88+
+86 +82 +88 +87 +104

The Measurements on this page were taken on 26/1

(54)

26/1/2023

(35) Column - AC/2C
(Pl - 330)

117+ 96+ 100+ 104 109+
188+ 117+ 93+ 116+ 99+
99+ 105+ 124+ 95+ 89+
DB+ DB+ DB+ DB+ 131+
104+ 106+ 126+ 99+ 121+
DB 103 + DB + 131+ 186+ 211+
DB+ DB+ DB+ DB+ DB+
DB+ DB+ DB+ DB+ DB+

(36) Column - AC/1C
(Pl - 340)

+DB+ DB +DB+109 +99 +
+DB +142 +144+ DB+ DB
+130 +DB +158+DB+ 158
+129 +129+DB+ 98+ 116
+88 +109 +DB +112 + 123
+100 +91 +DB +DB + DB
+160 +DB + DB + DB + DB
+159 +DB +DB +DB+92

(Fill column DB pending)

The Measurements on this page were taken on 26/1

(55)

Block - 'C'

26/1/2023

Basment

Column - BC/1C

(P1 - 390)

+87 +94 +86 +95 +97 +101
+105 +99 +97 +94 +96 +90
+85 +95 +101 +96 +93 +100
+87 +94 +96 +94 +89 +96
+86 +92 +92 +91 +93 +97
+87 +89 +88 +88 +90 +105
+86 +95 +121 +DB +DB +DB
+192 +123 +141 +DB +DB +DB

(38) Column - CC/1C

(P1 - 330)

98+ 85+ 89+ 90+ 90+
96+ 97+ 98+ 98+ 93+
94+ 99+ 100+ 94+ 93+
89+ 95+ 96+ 97+ 93+
88+ 95+ 96+ 94+ 90+
90+ 87+ 90+ 88+ 89+
95+ 86+ 89+ 95+ 102
86+ 97+ 87+ 87+ 88
104+ 100+ 96+ 93+ 99+
DB+ 105+ 103+ 99+ 100+
DB+ 90+ DB +84 +82 +

The Measurements on this page were taken on 26/1

56

Block - C, Basment

26/1/2023

Subdivision

BC - CC / 8C - 10C

(39) Slab

(P1 - 300)

+83 +81 +73 +68 +71 +64
+77 +74 +66 +75 +73 +73
+83 +76 +80 +74 +55 +60
+80 +76 +84 +78 +78 +63
+69 +72 +81 +80 +83 +80
+80 +84 +77 +90 +93 +84

(40) Beam - ~~BC/8C~~ BC/8C-10C

(P1 - 225)

+ + + + + + + + + +
56 55 55 57 56 56 57 58 58 55 56

57

The Measurements on this page were taken on 26/1

25-1-23

(45) Slab ~~Beam~~ EC-FC/10C-11C (Godown)

+52 +65 +79 +78 +64 +

+51 +73 +83 +68 +68 +

+54 +80 +63 +80 +66 +

+56 +76 +76 +80 +70 +

+54 +65 +61 +75 +76 +

+59 +65 +65 +85 +62 +

(46) Slab EC-CC/12C-11C (P1-300) godown

+84 +69 +91 +72 +64 +53

+70 +76 +82 +83 +66 +64

+90 +88 +67 +72 +82 +65

+82 +79 +66 +67 +78 +74

+49 +60 +80 +74 +71 +80

+72 +90 +99 +76 +71 +76

The Measurements on this page were taken on 22/1

(47)

(41) Block-C, Basement 27/01/2023

Beam - AC/3C - 10C (P1-350)

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 102 | 92 | 92 | 96 | 97 | 100 | 100 | 90 | 102 | 98 | 124 | 120 | 121 | 97 | 115 | 112 | 117 | 99 | 111 | 97 | 95 | 97 | 94 |
| + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| 91 | | | | | | | | | | | | | | | | | | | | | | | |
| + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| | 107 | 160 | 100 | 98 | 100 | 98 | DB | DB | DB | DB | DB | DB | DB | DB | DB | DB | DB | DB | DB | DB | DB | 139 | DB |

(42) Beam - EC-FC / 11C (P1-230)

The Measurements on this page were taken on 22/1

+55 +57 +57 +58 +57 +58 +59 +59 +55 +58 +56

(43) Beam EC-FC/11C-10C (P1-230)

+57 +58 +57 +59 +59 +56 +56 +60 +59 +60 +56 +56 +57 +58 +57

(44) Beam EC-CC/11C-12C (P1-230)

(47) Slab KC-HC/11C-12C (Pl 300)

+67 +76 +82 +64 +66 +

+66 +74 +71 +78 +62 +

+60 +74 +79 +82 +60 +

+61 +79 +75 +71 +56 +

+66 +76 +77 +69 +68 +

+66 +65 +68 +75 +63 +

+52 +78 +69 +58 +61 +

(48) Slab CC-BC/2C-3C (Pl 300)

+78 +83 +86 +90 +66 +

+75 +78 +73 +80 +72 +

+75 +66 +79 +78 +64 +

+86 +89 +75 +90 +81 +

+75 +74 +68 +66 +89 +

+85 +62 +96 +76 +71 +

The Measurements on this page were taken on 22/1





(49) Beam - KC-HC/11C (Pl - 230)

+55 +56 +53 +54 +54 +55 +56 +54 +55 +50

(50) Beam - KC/10C-11C (Pl - 230)

+55 +60 +59 +60 +60 +62 +59 +60 +64 +61 +62 +61 +59 +59 +65

(51) Beam LC/10C-9C (Pl - 230)

+70 +58 +61 +59 +56 +58 +61 +62 +60 +59 +57 +52 +54

(52) Beam KC/3C-6C (Pl - 230)

+51 +56 +55 +56 +55 +55 +55 +54 +58 +57 +57 +57 +71

(53) Beam CC-KC/3C-4C (230-Pl)

+58 +58 +56 +57 +59 +55 +58 +59 +51 +61

The Measurements on this page were taken on 22/1

27/1/2023

4) Column KC/1C
(Pl-330)

+DB +97 +98 +91 +96 +94
+97 +95 +120 +95 +93 +84
+97 +95 +96 +97 +96 +94
+98 +98 +93 +88 +96 +87
+96 +98 +93 +95 +98 +94
+DB +DB +99 +102 +93 +112
+DB +DB +DB +DB +190 +DB

5) Slab KC-CC/1C
5d/7d - ~~8d~~ 8d

+68 +70 +75 +73 +66 +
+60 +68 +59 +65 +60 +
+54 +67 +77 +72 +60 +
+56 +70 +74 +64 +62 +
+56 +60 +73 +65 +68 +
+61 +66 +67 +60 +73 +

Endirict

The Measurements on this page were taken on ...27/1...

Jk

21

27/1/2023

56) Beam - BC-AC/2C (230)

+56 +52 +56 +58 +57 +59 +56 +54 +53

57) Beam BC/2C-3C. (230)

+55 +56 +54 +56 +56 +55 +57 +54 +57 +57

58) Beam - CC/2C-3C (230)

50 50 53 55 54 54 51 51 53 51 52 52 51 53 63
+ + + + + + + + + + + + + + +

59) Beam MC/2C-3C (Pl-~~230~~ 420)

+120 +122 +128 +183 +184 +183 +128 +125 +116
+DB +DB +DB +DB +DB +DB +DB +DB +DB

60) Beam KC-HC&C/1C-2C.
(Pl-230)

55 + 55 + 56 + 54 + 54 + 57 + 54 + 56 + 56 + 60 + 59 + 57 + 58 + 57 + 55 + 55 +

The Measurements on this page were taken on ...27/1...

Jk

22

27/01/2023

(G1) Slab { AC-1c / Retaining wall
AC-6d / Retaining wall }

| | | | | | |
|---|---|---|---|---|---|
| + | + | + | + | + | + |
| 70 | 80 | 66 | 63 | 68 | 71 |
| + | + | + | + | + | + |
| 75 | 74 | 68 | 70 | 64 | 69 |
| + | + | + | + | + | + |
| 77 | 77 | 80 | 68 | 63 | 72 |
| + | + | + | + | + | + |
| 77 | 78 | 74 | 72 | 70 | 75 |
| + | + | + | + | + | + |
| 75 | 65 | 70 | 73 | 70 | 70 |
| + | + | + | + | + | |
| 81 | | | | | |

Endwise

Shear wall – 2C-GC/3C (Pl-345)

| | | | | | |
|---|---|---|---|---|---|
| +99 | +100 | +97 | +97 | +97 | +101 |
| +98 | +99 | +97 | +95 | +95 | +93 |
| +96 | +96 | +93 | +94 | +92 | +91 |
| +96 | +98 | +97 | +99 | +97 | +93 |
| +95 | +99 | +101 | +105 | +107 | +105 |
| +100 | +99 | +99 | +98 | +98 | +97 |
| +102 | +96 | +93 | +98 | +99 | +98 |
| +99 | +100 | +95 | +95 | +97 | +96 |
| +96 | +100 | +99 | +95 | +94 | +97 |
| +96 | +93 | +90 | +93 | +95 | +91 |

The Measurements on this page were taken on 27/1

(73)

Page-(72)

① (G3) Beam – MC / 3C – 10C

+120 +121 +105 +97 +97 +96 +100 +96 +99 +112 +115 +117 +109 +118 +101 +91 +99 +100 +112 +105 +116
+DB +DB +140 +103 +DB +DB +114 +DB +113 +98 +102 +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB
DB

3C → (Bottom bar DB)

+93 +97 +130 +DB +93 +93 +106 +13 +120 +93 +99 +DB +DB + DB

+ DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB

10C ← (24) 10C

(1 to 34)

(G4) Beam – KC-CC / 1C (Pl-330) (1 to 34)

+DB +DB +112 +DB +116 +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB +DB

(5) Slab – Kc-Cc / 1c-2c

| | | | | | |
|---|---|---|---|---|---|
| +55 | +62 | +74 | +71 | +73 | + |
| +64 | +69 | +75 | +80 | +68 | + |
| +68 | +74 | +74 | +75 | +72 | + |
| +67 | +83 | +80 | +69 | +75 | + |
| +66 | +74 | +76 | +70 | +78 | + |
| +63 | +74 | +80 | +88 | +79 | + |

(6) Slab Kc-Lc / 1c-2c

Indirect

(300)

| | | | | | |
|---|---|---|---|---|---|
| +77 | +82 | +70 | +82 | +70 | + |
| +79 | +78 | +71 | +78 | +91 | + |
| +70 | +74 | +72 | +73 | +70 | + |
| +78 | +90 | +83 | +74 | +69 | + |
| +70 | +83 | +86 | +71 | +74 | + |
| +90 | +86 | +84 | +80 | +81 | + |

The Measurements on this page were taken on 27/1/...





(7) Slab 9d-10d / 5d-Rd

| | | | | | |
|---|---|---|---|---|---|
| +71 | +74 | +69 | +119 | +131 | + |
| +83 | +77 | +80 | +126 | +79 | + |
| +69 | +83 | +70 | +76 | +78 | + |
| +61 | +71 | +113 | +123 | +70 | + |
| +73 | +120 | +118 | +107 | +58 | + |
| +66 | +137 | +140 | +108 | +117 | + |

Indirect

Surface Leakage & DB

The Measurements on this page were taken on 27/1/...

28/01/2023

(68) Tower-'B' Basement

(3) Slab 14d-A6/5d-Rd (Pl-300)

+71 +68 +70 +69 +60 +

+71 +81 +77 +73 +65 +

+73 +74 +74 +80 +72 +

+78 +86 +75 +84 +61 +

+79 +71 +70 +78 +64 +

+68 +74 +73 +75 +69 +

RHT

(69) Slab - Kb-H6 / 10b-11b

Tower-B - Basement

(Pl-300)

+78 +70 +72 +76 +60 +

+66 +68 +74 +74 +69 +

+74 +71 +71 +73 +66 +

+73 +74 +61 +64 +61 +

+61 +68 +64 +66 +67 +

+68 +74 +72 +68 +71 +



28/01/2023

Tower-C, Basement

(70) Beam Ac-6d/Hd (Pl-330)

81 86 83 89 91 88 90 86 88 87 87 87 85 86 87 89 88 86 85 85

84 91 83 88 85 88 89 84 85 87 84 85 84 84 83 82 83 81 81 82

(71) Beam - Gd/Hd/5d-6d (330)

(72) Beam - Gd-Jd/22d (Pl-330)

Tower-B Basement

(71) Beam - Gd/24d-25d (Pl-330)

RHT -
Slab - Gd-Jd/24d-25d

| | | |
|---|---|---|
| 52 | 50 | 54 |
| 51 | 58 | 54 |
| 51 | 52 | 54 |

90 82 83 85 82 82 81 78 76 78 79 81 80 72

86 85 89 85 84 86 79 83 82 84 73 79 84 76 81 82 80 84 85

) Slab – Gd-Jd/24d-25d

+50 +70 +77 +65 +81 +82
-63 +64 +80 +79 +83 +80
-68 +80 +76 +83 +75 +
F64 +85 +82 +71 +68 +
+57 +64 +59 +76 +79 +
+80 +76 +75 +69 +80 +

(74) Slab – Gd-Dd/21d-22d

+77 +90 +75 +79 +80 +78
+80 +78 +74 +71 +77 +
+75 +71 +74 +80 +77 +
+60 +74 +80 +78 +77 +
+69 +71 +72 +78 +76 +
+65 +76 +74 +78 +73 +

Indirira

) Slab – Gd-Jd/19d-20d

+83 +80 +74 +81 +76 +
+78 +84 +71 +78 +88+
+76 +72 +84 +83 +77 +
+87 +74 +76 +85 +86 +
+72 +73 +86 +78 +82 +
+76 +80 +79 +74 +70 +

(76) Slab – Gd-Dd/16d-15d

+67 +82 +69 +74 +66 +
+81 +76 +68 +85 +89 +
+65 +71 +80 +70 +73 +
+73 +68 +71 +69 +65 +
+76 +64 +69 +68 +65 +
+65 +66 +71 +72 +72 +

Slab ↑ RHT – Slab.

| | | |
|---|---|---|
| 54 | 58 | 56 |
| 58 | 56 | 52 |
| 56 | 54 | 56 |

RHT ↑

| | | |
|---|---|---|
| 58 | 54 | 56 |
| 58 | 58 | 54 |
| 56 | 56 | 58 |





(77) Beam – Gd-Dd/21d (330)

+84 +86 +87 +88 +85 +86 +83 +87 +85 +85

RHT

Slab – Gd-Dd/21d-22d

| | | |
|---|---|---|
| 54 | 50 | 56 |
| 56 | 54 | 58 |
| 58 | 56 | 54 |

(78) Beam – Jd/20d-19d (Pl-330)

+90 +88 +92 +94 +95 +97 +98 +100 +100 +103 +85 +78 +96 +100 +96 +101

(79) Beam Dd/15d-17d (340)

(80) Beam – Hd-Dd/15d (340)

Tower-B, Basement 28/01/2023

31) Beam - ~~Hd-Kd~~ Md-Kd/15d

Direct (330)

+62 +53 +66 +59 +53 +64 +64 +64 +68 +67 +63 +63 +62 +62 +71 +77

+62 +58 +61 +60 +58 +61 +66 +63 +62 +65 +61 +64 +62 +65 +69 +66

Indirect ↑

5) Beam: Hd/M6-15d

(330)

+61 +60 +60 +61 +60 +66 +64 +62 +66 +62 +71 +66 +59

Beam - Hd/15d-16d (330)

+53 +69 +78 +74 +60 +60 +62 +71 +83 +77 +81 +66 +64 +63 +72 +64 +62 +64 +68 +62 +63 +69

+80 +79 +83 +80 +61 +59 +63 +66 +87 +76 +70 +62 +62 +60 +62 +60 +60 +58 +60 +61 +60 +63

) Beam - Jd-Gd/16d (330)

+79 +65 +69 +65 +67 +68 +66 +68 +63 +62 +73 +64 +65 +71 +63 +63 +66 +62 +65

+72 +66 +68 +80 +68 +66 +67 +76 +74 +69 +65 +64 +65 +69 +65 +65 +69 +71 +68

Beam



28/01/2023

Slab (B5) Kd-Ld/Md-15d

+54 +50 +52 +51 +53 +

+52 +54 +56 +60 +65 +

+51 +54 +52 +54 +56 +

+56 +59 +58 +48 +49 +

+48 +46 +52 +48 +49 +

+49 +50 +52 +61 +51 +

RHT- ↑

| | | |
|---|---|---|
| 54 | 56 | 52 |
| 56 | 50 | 58 |
| 54 | 56 | 52 |

Slab (B6) Kd-Ld/15d-16d

+50 +60 +71 +63 +49 +

+60 +57 +61 +51 +54 +

+64 +61 +60 +70 +69 +

+56 +51 +49 +57 +61 +

+53 +54 +55 +60 +51 +

+51 +52 +60 +49 +54 +

RHT ↑

| | | |
|---|---|---|
| 58 | 50 | 52 |
| 54 | 52 | 54 |
| 56 | 50 | 56 |

30-01-2023

'C' Tower, Ground Floor

) Column - Lc/10c (330)

+104 +99 +102 +103 +103
+103 +96 +101 +105 +101
+101 +96 +105 +98 +97
+100 +95 +94 +96 +95
+108 +98 +105 +107 +107
+101 +91 +95 +98 +100
+93 +91 +92 +97 +96
+89 +87 +91 +86 +95
+92 +87 +89 +91 +90
+95 +86 +87 +86 +85
+97 +85 +89 +88 +87
+DB +DB +46 +DB +DB
(DB)

Resiped - 70, 57, 60, 74, 63

② Column Lc/12c

Individ (Pl-300)

+87 +84

Semidirect (Pl-175 & 175)

+ 108
+84 +81 +
+ 81
+80 +81 +
+ 82
+85 +86 +
+ 84
+85 +89 +
+ 84
+87 +86 +
+ 82
+85 +86 +
+ 78
+90 +81 +
+ 71
+87 +84 +
+ DB
+ DB
+ DB
+DB +DB +

175
175

Resiped
56, 58 64 70 53
80 56 54

) Beam - ~~Lc/8c~~ Mc/Lc/6c (230)

+ + + + + + + + + + + +
65 69 60 62 61 62 62 61 63 60 62

Resiped
54 45 58
48 60 52

) Beam - Lc-Kc/10c (230)

+60 +61 +58 +59 +58 +58 +58 +60 +57 +59

⑤ Slab - Lc-Kc/10c-11c

+80 +79 +80 +73 +79 +
+80 +69 +70 +71 +70 +
+75 +78 +73 +69 +56 +
+73 +76 +73 +67 +60 +
+79 +77 +66 +73 +79 +
+73 +74 +79 +77 +65 +

RHT

⑦

| | | |
|---|---|---|
| 36 | 34 | 34 |
| 32 | 36 | 32 |
| 32 | 34 | 36 |

⑥ Slab Lc-Kc/11c-12c

+61 +68 +69 +66 +67 +
+61 +70 +71 +74 +59 +
+73 +71 +76 +63 +68 +
+63 +59 +65 +72 +74 +
+58 +60 +76 +65 +68 +
+74 +63 +75 +68 +65 +

⑧ RHT

| | | |
|---|---|---|
| 32 | 34 | 30 |
| 38 | 54 | 30 |
| 32 | 32 | 32 |

⑩ Resiped - 54 50 52
60 54 48

⑨ Beam - Lc-Mc/11c (240)

+64 +65 +63 +65 +63 +63 +62 +61 +62 +64 +62 +63 +62 +64

⑪ Beam - Kc/2c (220)

+65 +62 +60 +68 +60 +61 +61 +59 +63 +64 +60 +63 +61 +60 +63 +61

'C' Tower, Ground Floor

30-01-2023

slab - Mc-Lc/2c-10c

66 + 74 + 65 + 80 + 74 +
67 + 71 + 77 + 69 + 81 +
70 + 76 + 80 + 81 + 82 +
68 + 75 + 74 + 67 + 69 +
70 + 77 + 74 + 74 + 74 +
73 + 69 + 74 + 76 + 73 +

RHT

| | | |
|---|---|---|
| 36 | 34 | 34 |
| 36 | 38 | 32 |
| 32 | 34 | 34 |

Resipod

| | | |
|---|---|---|
| 56 | 44 | 38 |
| 44 | 64 | 46 |
| 42 | 44 | 40 |

(13) Slab - Lc-Kc/3c-5c

+60 +66 +60 +68 +70 +
+74 +70 +62 +58 +60 +
+74 +71 +67 +60 +59 +
+68 +65 +62 +68 +69 +
+72 +64 +70 +60 +56 +
+74 +78 +77 +71 +68 +

(15) RHT

| | | |
|---|---|---|
| 32 | 32 | 30 |
| 38 | 34 | 32 |
| 34 | 36 | 34 |

(17) Resipod

68, 70, 56 54 49 50 62

Tower 'C', Ground Floor

(18) Column - Lc/5c (P1 - 440)

+131 +130 +127 +123 +122 →
+123 +124 +126 +125 +109
+128 +130 +129 +125 + 112
+127 +128 +121 +127 +115
+126 +123 +130 +124 +117
+116 +126 +123 +120 + DB
+119 +117 +124 +125 + DB
+118 +122 +120 +122 +126
+117 +116 +124 +126 + DB
+113 +115 +116 +120 +129
+121 +118 +115 +123 + DB.

(19) Column - Lc/1c

Semi circle (17x17)

| | | |
|---|---|---|
| + 50 | + 85 | + 84 + |
| + 73 | + 82 | + 90 + |
| + 77 | + 82 | + 82 + |
| + 56 | + 80 | + 92 + |
| + 55 | + 86 | + 91 + |
| + 59 | + 87 | + 89 + |
| + 57 | + 83 | + 85 + |
| + 59 | + 80 | + 82 + |
| + 64 | + 82 | + 83 + |
| + 62 | + 79 | + 74 + |
| + 70 | + 86 | + 80 + |
| + 71 | + 78 | + 85 + |

(Individual - Beam)

(20) Resipod

74, 80, 76, 68, 75, 82 70.

(21) Resipod - 56, 54 64 60

(22) Beam EC-cc/1c - Half cell Post

| | | |
|---|---|---|
| -284 | -264 | -296 |
| -269 | -310 | -325 |
| -298 | -317 | -330 |

(23) Resipod

57 80 68 54 52

TOWER 'C', Ground Floor 30/1/2023

1) column - Hc/2c

| | | | |
|---|---|---|---|
| 93 | +86 | +90 | |
| 96 | +85 | +84 | |
| 92 | +90 | +89 | |
| 97 | +100 | +110 | |
| 88 | +90 | +91 | |
| 101 | +96 | +101 | |
| 97 | +112 | +114 | |
| 102 | +104 | +102 | |
| | +DB | +DB | |

Indirect (300)

25) Test Cell

| | | |
|---|---|---|
| -306 | -268 | -346 |
| -274 | -310 | -290 |
| -281 | -278 | -315 |

26) Resiped Test ↑

72, 57 56 54 58 68

27) Column - BC/2c (Pl-730)

Resiped Test ↑ 72, 57, 69 74 54 58

| | | |
|---|---|---|
| | + | + |
| | + | + |
| | + | + |
| 210 | + | + |
| 214 | + | + |
| 220 | + | + |
| 218 | + | + |
| 211 | + | + |
| 210 | + | + |
| 205 | + | + |
| DB | + | + |
| DB | + | + |

28) Slab EC-cc/1c-2c

| | | | | | |
|---|---|---|---|---|---|
| +60 | +54 | +59 | +70 | +64 | + |
| +65 | +61 | +67 | +61 | +67 | + |
| +62 | +60 | +68 | +63 | +70 | + |
| +59 | +68 | +69 | +71 | +66 | + |
| +65 | +71 | +57 | +71 | +70 | + |
| +70 | +74 | +74 | +72 | +63 | + |

29)

RHT ↑

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 34 | 40 | 38 |
| 34 | 36 | 32 |

30) Resiped Test ↑

74, 56, 54, 62 72

TOWER 'C' Ground Floor 30/1/2023

31) Column - Cc/3C (330)

| | | |
|---|---|---|
| +89 | +86 | +90 |
| +73 | +88 | +96 |
| +94 | +83 | +85 |
| +90 | +84 | +86 |
| +94 | +96 | +97 |
| +92 | +95 | +98 |
| +86 | +88 | +84 |
| +85 | +86 | +90 |
| +83 | +76 | +78 |
| +82 | +81 | +83 |
| +84 | +81 | +82 |

Resiped ↑ 74, 58 69 54 72

33)

32) Column Bc/8c (A-440)

| | | | | |
|---|---|---|---|---|
| + | + | + | + | +118 |
| +120 | +119 | +124 | +120 | +118 |
| +118 | +111 | +116 | +120 | +120 |
| +120 | +121 | +119 | +122 | +122 |
| +120 | +114 | +113 | +120 | +124 |
| +120 | +124 | +127 | +125 | +116 |
| +121 | +123 | +124 | +110 | +113 |
| +124 | +125 | +123 | +125 | +114 |
| +124 | +125 | +126 | +121 | +119 |
| +DB | +122 | +110 | +119 | +109 |
| +DB | +DB | +DB | +DB | +DB |

34) Beam - BC/AC/8C ( )

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| +59 | +61 | +60 | +60 | +58 | +57 | +57 | +58 | +60 | +61 | +58 |

36) Resiped Test, 54 60 70 74 58

Tower 'C' G. Floor. 30/1/2023

(36) Column. Bc/11c (740)

+204 +205
+205 +206
+202 +202
+194 +202
+207 +207
+207 +210
+194 +201
+200 +202
+201 +204
+204 +198
+DB +DB

(37) Column Ac/12 (300) Indirect

| | | | | |
|---|---|---|---|---|
| 74 | +89 | +90 | +76 | +8 |
| 76 | +94 | +90 | +84 | +86 |
| 70 | +90 | +87 | +90 | +87 |
| 74 | +85 | +82 | +91 | +93 |
| 80 | +90 | +86 | +88 | +90 |
| 75 | +96 | +97 | +93 | +94 |
| 70 | +89 | +94 | +90 | +95 |
| 65 | +92 | +90 | +86 | +87 |
| 61 | +96 | +80 | +83 | +92 |
| 71 | +DB | +DB | +DB | +DB |
| 74 | +DB | +87 | +95 | +DB |
| DB | 96 DB | +97 | +93 | +83 |

In semi direct (180 x 180)

180 x 180

(38) Resiped Test ↑

58, 43, 60 54 57
64 47 63 55

(39) Resiped Test ↑

56 54 60 72 68 52
66

(40) Beam - Bc/10c-11c (230)

+61 +58 +59 +58 +58 +59 +58 +61 +59 +62

(41) Slab. BC-cc/10c-11c

| | | | | | |
|---|---|---|---|---|---|
| +69 | +70 | +74 | +73 | +70 | |
| +74 | +80 | +77 | +66 | +71 | |
| +75 | +70 | +79 | +71 | +80 | |
| +66 | +70 | +63 | +66 | +58 | |
| +64 | +61 | +66 | +79 | +74 | |
| +60 | +64 | +70 | +68 | +71 | |

(42) Column - Ac/10c (Indirect) 300

| | | | |
|---|---|---|---|
| 72 | +90 | +96 | +86 |
| 73 | +94 | +91 | +86 |
| 75 | +94 | +90 | +82 |
| 64 | +85 | +90 | +81 |
| 73 | +93 | +94 | +83 |
| 74 | +86 | +84 | +94 |
| 73 | +90 | +81 | +90 |
| 72 | +85 | +87 | +92 |
| 73 | +91 | +86 | +88 |
| 74 | +83 | +85 | +86 |
| 75 | +86 | +96 | +91 |

Semi direct (180 x 180)

180 x 180

(43) RHT ↑

| | | |
|---|---|---|
| 29 | 34 | 30 |
| 32 | 31 | 30 |
| 34 | 36 | 32 |

(44) Resiped Test ↑

57, 69, 78, 72, 62, 66, 56,

(45) Resiped Test ↑

62, 69, 52, 57 59

TOWER-'C', Ground Floor
Half cell Test

30/11/2023

1) Column - 11c/12c

| | | |
|---|---|---|
| -212 | -236 | -224 |
| -209 | -241 | -231 |
| -244 | -229 | -216 |

(47) Resiped Test
column 11c/12c

| | | | |
|---|---|---|---|
| 57 | 34 | 39 | |
| 46 | 30 | 38 | |

(48) column 12c/10c

(49) Column - Kc/10c
Resiped Test

| | | |
|---|---|---|
| -340 | -285 | -306 |
| -365 | -309 | -264 |
| -346 | -295 | -319 |

| | | |
|---|---|---|
| 26 | 42 | 24 |
| 40 | 38 | 36 |
| 27 | 33 | 44 |

(50) G.floor. Column - BC/10c Resiped

(51)

| | | |
|---|---|---|
| -301 | -285 | -260 |
| -244 | -286 | -288 |
| -215 | -317 | -320 |

54, 52, 64 68 72
58 60 55 54

24/01/23 – Beam · 9
Slab – 2
Col – 12

Kala Kalam

25/1/23 Beam Block B – 2 #

11 – Beams 16 +5 = 21 Black
Column 02 +13 = 15 colms
Slabs – 09 +6 = 15 Slabs

11 – Beam – 12
Slab – 03
RHT – 05

26/01/23
UPVT – 18 – Toilets
Column – 18
Slabs – 1
Beam – 1

21 – column UPVT – Parking/drive area.

8 – RHT

30/1/23 – UPVT { Slab – 6, Beam – 6, Column – 11 } 23 total.

RHT – 5
Raised – 15
Half cut – 05

18
21
C – 17
S – 1
B – 1
RHT Slab – 8.

Half cell potential difference measurements

21/01/2023

COLUMN - (9b) (K6)

| | | |
|---|---|---|
| -197 | -156 | -93 |
| -150 | -145 | -132 |
| -140 | -127 | -168 |

TOWER-B

1) Staircase mid landing L&L
Manovary wall → 8'6" x 4'0" → plastering & work

Staircase waste slab.

UPVT COLUMN TOWER-B

23/01/2023

COLUMN (Kb) - (2b) (440x1530)

PL - 440

| | | | | |
|---|---|---|---|---|
| +120 | +115 | +115 | +114 | +116 |
| +119 | +119 | +118 | +116 | +116 |
| +119 | +119 | +118 | +116 | +115 |
| +118 | +117 | +112 | +117 | +118 |
| +114 | +111 | +112 | +112 | +114 |
| +110 | +104 | +105 | +103 | +110 |
| +118 | +116 | +114 | +118 | +114 |
| +116 | +109 | +112 | +112 | +110 |
| +112 | +117 | +108 | +111 | +110 |
| +111 | +107 | +108 | +110 | +109 |
| +102 | +104 | +106 | +106 | +105 |

Signed

23/01/23

COLUMN (Lb) - (9b) TOWER-B

PL - 990

| | |
|---|---|
| +214 | +199 |
| +215 | +198 |
| +202 | +199 |
| +198 | +187 |
| +210 | +223 |
| +213 | +206 |
| +196 | +200 |
| +204 | +201 |
| +233 | +206 |
| +226 | +226 |
| +225 | +230 |

Signed

23/01/23

61 - B

UPVT

COLUMN (C6) - (1b) ** Debonded column @ bottom

PL - 440mm

Tower - B

+ 117 + 116 + 113 + 116

+ 118 + 112 + 114 + 113

+ 114 + 116 + 118 + 113

+ 114 + 112 + 112 + 115

+ 123 + 132 + 119 + 123

+ 126 + 118 + 118 + 120

+ 113 + 110 + 114 + 117

+ 117 + 109 + 113 + 119

+ 117 + 116 + 111 + 119

+ Db + 262 + Db + Db

(C6 Any Rectangular main)
03/01/2023

COLUMN - (2b) (C6)

TOWER - B

PL - 440 mm

+ 113 + 114 + 121 + 110 + 112

+ 132 + 120 + 109 + 110 + 111

+ 113 + 111 + 112 + 109 + 118

+ 113 + 111 + 112 + 108 + 107

+ 125 + 132 + 124 + 113 + 104

+ 137 + 128 + 117 + 115 + 113

+

+ 122 + 115 + 112 + 111 + 111

+ 115 + 119 + 114 + 108 + 114

+

+ 117 + 114 + 105 + 106 + 110

+ 142 + 142 + 111 + 109 + 111

+ 109 + 106 + 106 + 105 + 103

UPVT

23/01/2023

COLUMN - (26) - (36)

TOWER-B

PL - 440 mm

+ 103 + 95 + 110 + 95 + 99 + 99
+ 97 + 96 + 121 + 117 + 116 + 108
+ 97 + 101 + 124 + 94 + 110 + 99
+ 93 + 104 + 105 + 94 + 94 + 107
+ 97 + 97 + 101 + 103 + 122 + 109
+ 96 + 94 + 116 + 103 + 101 + 102
+ 97 + 107 + 98 + 93 + 96 + 104
+ 99 + 90 + 95 + 97 + 97 + 93
+ 87 + 88 + 91 + 101 + 92 + 89
+ 212 + 102 + 94 + 92 + 93 + 88
+ 202 + 286 + 224 + 92 + 90 + 95

COLUMN (16) - (86)

TOWER B

+ 134 + 123 + 126 + 141 + 133
+ 131 + 120 + 132 + 124 + 136
+ 124 + 122 + 122 + 123 + 133
+ 136 + 136 + 133 + 122 + 136
+ 134 + 133 + 142 + 138 + 127
+ 127 + 119 + 135 + 165 + 127
+ 134 + 113 + 138 + 160 + 117

03-B

24/01/2023

UPVJ

COLUMN – (A6) – (16)

PL – Ø40MM

TOWER – C

COLUMN MC/2C on Hill

Indirect

~~+ 133 + 318 +~~ ~~+ 85 +~~

+ 134 + 91 + 98.9 + 123 + 85 +

+ 136 + 145 + 263 + 200 + 93 +

+ 127 + 94 + 220 + 173 + 86 +

+ 121 + 87 + 99 + 110 + 82 +

+ 126 + 90 + 89 + 121 + 86 +

+ 92 + 94 + 162 + 136 + 75 +

+ 132 + 104 + 99 + 105 + 125 +

Certified that above measurements are taken during the day

04 - B

TOWER - C Basement PL - 440mm

Column - 4C / 4C

+ 92 + 174 + 177 + Db + 107 + 91

+ 91 + 97 + 187 + Db + 90 + 85

+ 88 + 98 + 161 + 149 + 105 + 88

+ 98 + 153 + 219 + 234 + 99 + 94

+ 215 + 197 + 164 + 196 + 121 + 93

+ Db + Db + Db + Db + 380 + Db

+ Db + Db + Db + Db + 346 + 338

+ 376 + 290 + 116 + 146 + Db + Db

24/01/23

TOWER - C Basement

Column 2C - 1C PL = 440mm

+ 97 + 97 + 100 + 97 + 108 + 101

+ 93 + 99 + 96 + 98 + 98 + 96

+ 82 + 88 + 98 + 100 + 89 + 104

+ 90 + 93 + 103 + Db + Db +

+ 112 + 145 + 94 + Db + Db + Db

+ 126 + 101 + Db + Db + Db + Db

+ 91 + 97 + Db + Db + Db + Db

Certified that above measurements are taken during my duty

05-05

TOWER C Basement 24/01/23

column - (1C) / (2C)

PL = 340 mm

+191 +197

+198 +196

+199 +200

+201 +202

+206 +208

+217 +210

+201 +200

+197 +199

+274 +Db

+Db +Db

TOWER-C Basement

column (1C) / (3C)

PL - 330 mm

+95 +93 +97 +97 +100

+101 +94 +95 +97 +96

+92 +88 +90 +93 +94

+108 +145 +103 +96 +99

+103 +101 +99 +92 +101

+96 +97 +100 +92 +98

+101 +102 +101 +92 +99

+98 +103 +100 +96 +102

+82 +100 +99 +116 +125

+130 +Db +Db +Db +140

06-B

TOWER- C Basement 24/01/23

Column - (LC)(EC)

PL = 330

+ 118 + 123 121 + 126 124 +119 +119 +125 +Db
+ 114 + 119 + 123 +116 + 119 +Db +Db
+ 112 + 115 + 123 + 117 + 112 + 210 + Db
+ 114 + 120 + 120 + 118 + 120 + 121 + 126
+ 121 + 117 + 116 + 115 + 117 + 126 + 118
+ 107 + 106 + 109 + 110 + 115 + 104 + 119
+ 142 + 148 + 149 + 170 + 135 + 99 + 96
+ 114 + 115 + 113 + 120 + 102 + 181 + 117
+ 102 + 109 + 109 + 115 + 109 + 112 + 114
+
+ 168 + 165 + 109 + Db + 111 + Db + Db

TOWER-C Basement

COLUMN - (LC)(EC)

PL = 330

+ 119 + 112 + 117 + 116 + 115 + 107 + 125
+ 107 + 111 + 111 + 110 + 114 + 113 + 167
+ 115 + 119 + 126 + 121 + 119 + 118 + 123
+ 115 + 114 + 123 + 119 + 118 + 115 + 120
+ 109 + 114 + 118 + 115 + 116 + 116 + 119
+ 110 + 110 + 118 + 115 + 116 + 110 + 120
+ 112 + 126 + 113 + 113 + 114 + 126 + 117
+ 111 + 109 + 112 + 116 + Db + Db + 189
+ 113 + 106 + 112 + 190 + Db + Db + Db
+ ← Db → +

07-B

TOWER - C Basement 24/01/23

Column - (KC) (2C)

DL = 7.40

+195 +192

+196 +191

+193 +191

+184 +178

+200 +190

+205 +199

+198 +203

+189 +199

+192 +197

+223 +254

+DL +DL

UDVT Tower C - Slab

Slab (1C) (KC) / (3C) (4C)

Undivided

+78 +89 +99 +67 +80

+89 +85 +87 +79 +84

+88 +73 +74 +84 +64

+66 +77 +80 +81 +72

+62 +78 +66 +63 +86

+66 +79 +64 +69 +68

25/01/2023

) Column -> KC | 3C - 4C

PL - 330mm

+106 + 110 + 96 + 114 + 120 + 112 + 120

+104 + 110 + 117 + 112 + 112 + 119 + 112

+120 + 127 + 106 + 105 + 115 + 121 + 122

+121 + 114 + 118 + 114 + 105 + 120 + 121

+107 + 112 + 114 + 115 + 116 + 116 + 112

+114 + 128 + 135 + 112 + 111 + 123 + 110

+109 + 111 + 111 + 112 + 123 + 111 + 112

+119 + 118 + 118 + 112 + 109 + 108 + 118

+120 + 117 + 123 + 121 + 117 + db + db

+db + db + db + db + 102 + db + db

09

25/01/2023

⑥ Column - KC | 6C Direct P2 = 630mm

+194 + 209 + 204 + 184

+193 + 245 + 190 +

+188 + 188 + 188 +

+214 + 213 + 221 + 191

+221 + 196 + 211 +

+205 + 199 + 196 +

+202 + 200 + 202 +

+190 + 189 + 205 +

+218 + 185 + 188 +

+205 + db + db +

+ db + db + db +

10

25/01/2023

Column — KC/9C — P2 = 640 mm

+206 +191 +217

+221 +206 +206

+202 +200 +199

+230 +197 +

+ + +

+192 + +

+ + +

+ + +



25/01/2023

(7) Column → KC/10C

P2 = 330 mm

92+103+112+95+92+95+94+99

96+93+94+98+95+97+103

100+97+98+95+94+93+94

98+94+88+86+63+111+133

132+129+122+131+124+96+89

96+91+92+95+96+99+90

95+98+97+131+123+117+123+89

+91+92+97+98+98+98+99+100

+90 89 +93+95+99+98+91+92

+170 +108 +123+106+108+106+106

25/01/2023

⑧ Column – C/12C Direct

P2 = 360mm

+96 +93 +94 +90 +88

+99 +107 +100 +104 +109

+144 +132 +151 +151 +134

+132 +136 +148 +113 +105

+89 +94 +95 +103 +107

+86 +96 +98 +109 +105

+96 +100 +99 +102 +101

+96 +99 +98 +101 +99

+93 +97 +103 +112 +110

+166 +222 +db +db +db

+154 +186 +228 +db +db



⑨ Column – 8C/8C P2 = 430mm 25/01/2023

+158 +db +db +115 +112 +112 +117

+98 +118 +147 +117 +112 +109 +110

+db +db +107 +116 +114 +113 +115

+db +db +ab +121 +124 +120 +128

+db +db +176 +122 +121 +120 +118

+238 +134 +114 +109 +113 +110 +112

+db +130 +109 +107 +113 +110 +107

+db +db +db +145 +138 +129 +132

+db +db +db +135 +102 +111 +109

+db +db +db +db +db +db +db.

25/01/2023

3) Column → 11c / Bc  PL = 340mm

| | |
|---|---|
| +234 | +128 |
| +263 | +266 |
| +205 | +248 |
| +219 | +245 |
| +198 | +219 |
| +201 | +209 |
| +195 | +197 |
| +191 | +198 |
| +191 | +192 |
| +295 | +275 |
| +db | +db |



26/01/2023

(11) Column → Ed - 2d  PL = 340mm

| | |
|---|---|
| + | + |
| +89 | +90 |
| +88 | +90 |
| +90 | +89 |
| +85 | +90 |
| + | +82 + |
| +84 | |
| +79 | |

(12) Column → 3d - Hd  PL = 340mm

| | |
|---|---|
| +86 | +83 |
| +89 | +90 |
| +81 | +85 |
| +86 | +85 |
| +84 | +84 |
| +92 | |
| +92 | |

(13) Column → Ed 14d  PL = 340mm

| | |
|---|---|
| +86 | +88 |
| +87 | +93 |
| +89 | +88 |
| +88 | +91 |
| +87 | +89 |
| +83 | +84 |
| +82 | +82 |
| +82 | |
| +81 | |

(14) Column → Ed 18d  PL = 340mm

| | |
|---|---|
| +78 | +88 |
| +82 | +79 |
| +82 | +79 |
| +80 | +79 |
| +79 | +76 |
| +79 | +77 |
| +79 | +76 |
| +79 | |
| +79 | |

26/01/2023

Column → 4d | 6d direct P2 = 340mm

| | |
|---|---|
| +82 | +81 |
| +88 | +88 |
| +86 | +86 |
| +86 | +85 |
| +84 | +83 |
| +83 | +82 |
| +85 | +84 |
| +85 | +85 |
| +85 | |
| +86 | |

(16) Column → 4d | 6d

| | |
|---|---|
| +84 | +83 |
| +89 | +90 |
| +87 | +87 |
| +88 | +111 |
| +89 | +92 |
| +90 | +86 |
| +86 | +87 |
| +90 | +90 |
| +91 | |
| +89 | |





(17) Column → 6d |

P2 = 330

| |
|---|
| +90 |
| +180 |
| +176 |
| +db |
| +d6 |
| +db |
| +d6 |
| +106 |

(18) Column - 5d | 7d

PL = 330

| |
|---|
| +117 +98 |
| +94 +97 |
| +116 +97 |
| +94 +96 |
| +94 +99 |
| +97 +112 |
| +92 +156 |
| +91 +150 |
| 157 + |
| ++ +db |

(19) Column → 5d | 9d

P2 = 330mm

| | |
|---|---|
| +91 | +91 |
| +92 | +94 |
| 93 | |
| +[illegible] | +97 |
| +109 | +116 |
| +89 | +87 |
| +92 | +91 |
| +89 | +85 |
| +87 | +87 |
| +89 | |
| +87 | |

(20) Column - 8d | 12d

PL - 330

| | |
|---|---|
| +91 | +86 |
| +91 | +87 |
| +85 | +91 |
| +89 | +78 |
| +89 | +84 |
| +89 | +84 |
| +90 | +85 |
| +92 | |
| +96 | |

Column Md/12d PL-340

| | |
|---|---|
| +92 | +90 |
| +100 | +98 |
| +87 | +93 |
| +91 | +90 |
| +90 | +92 |
| +84 | +82 |
| +84 | +79 |
| +83 | |
| +81 | |

(22) Column Hd/12d PL-340

26/01/23

| | |
|---|---|
| +107 | +115 |
| +114 | +109 |
| +117 | +115 |
| +109 | +120 |
| +108 | +128 |
| +111 | +116 |
| +108 | +110 |
| +101 | |
| +105 | |

Column Fd/13d PL-340

| | |
|---|---|
| +96 | +93 |
| +84 | +89 |
| +91 | +88 |
| +93 | +93 |
| +96 | |
| +91 | |

(24) Column Hd/14d PL-340

| | |
|---|---|
| +96 | +98 |
| +97 | +94 |
| +95 | +96 |
| +95 | +89 |
| +94 | +97 |
| +87 | +87 |
| +86 | +86 |
| +89 | |
| +90 | |

The Measurements on this page were taken on 26/1

(19)

(25) Column Fd/13d PL-340

| | |
|---|---|
| +113 | +114 |
| +116 | +107 |
| +111 | +113 |
| +109 | +113 |
| +108 | +108 |
| +108 | +106 |
| +110 | +102 |
| +109 | |
| +105 | |

(26) Column Md/14d PL-340

29/1/23

| | |
|---|---|
| +101 | +113 |
| +117 | +106 |
| +97 | +97 |
| +96 | +91 |
| +98 | +90 |
| +98 | +98 |
| +99 | +94 |
| +92 | |
| +91 | |

(27) Column Pd/13d PL-340

| | |
|---|---|
| +91 | +90 |
| +94 | +89 |
| +84 | +83 |
| +82 | +81 |
| +83 | +79 |
| +87 | +86 |
| +87 | +84 |
| +81 | |
| +83 | |

(28) Column Rd/14d PL-340

| | |
|---|---|
| +110 | +106 |
| +109 | +99 |
| +106 | +101 |
| +100 | +101 |
| +96 | +97 |
| +90 | +94 |
| +94 | +94 |
| +92 | |
| +89 | |

The Measurements on this page were taken on 29/1

(20)

26/1/23

) Column Fd/15d PL-340

| | |
|---|---|
| +93 | +99 |
| +88 | +94 |
| +98 | +90 |
| +88 | +89 |
| +84 | +86 |
| +82 | +85 |
| +83 | +82 |
| | +89 |
| | +82 |

) Column Fd/15d PL-340

| | |
|---|---|
| +87 | +100 |
| +90 | +88 |
| +87 | +93 |
| +94 | +86 |
| +90 | +89 |
| +89 | +85 |
| +85 | +82 |
| | +83 |
| | +81 |

The Measurements on this page were taken on ..... 26/1/2023

(21)

(30) Column Fd/15d PL-330

| | |
|---|---|
| +113 | +113 |
| +115 | +103 |
| +104 | +103 |
| +102 | +98 |
| +102 | +105 |
| +98 | +98 |
| +92 | +98 |
| | +95 |
| | +95 |

27/01/2023

(32) column -> Gd/17d (Direct)

+ PL = 340 mm

| | |
|---|---|
| +92 | +94 |
| +93 | +93 |
| +89 | +87 |
| +83 | +82 |
| +86 | +83 |
| +81 | +80 |
| +96 | +90 |
| +88 | +85 |

(33) Column -> Ld/16d (Direct)

PL = 340 mm

| | |
|---|---|
| +96 | +90 |
| +92 | +91 |
| +90 | +91 |
| +90 | +88 |
| +90 | +88 |
| +90 | +91 |
| +91 | +97 |
| +89 | +90 |
| | +90 |
| | +90 |

The Measurements on this page were taken on ..... 27/1/2023

(22)

Tower - B

27/01/2023

4) Column → 8d / 16d (Direct)

PL = 340 mm

| | |
|---|---|
| + | + |
| +85 | +98 |
| +99 | +98 |
| +99 | +100 |
| +97 | +99 |
| +90 | +95 |
| +97 | +95 |
| +90 | +89 |
| +93 | |
| +89 | |

5) Column → Nd / 18d (Direct)

PL = 340 mm

| | |
|---|---|
| +99 | +99 |
| +99 | +99 |
| +99 | +97 |
| +98 | +95 |
| +90 | +96 |
| +97 | +90 |
| +96 | +93 |
| +97 | |
| +99 | |
| +95 | |

The Measurements on this page were taken on 27/1

33

27/01/2023

36) Column → Ld / 20d (Direct)

PL = 340 mm

| | |
|---|---|
| + | + |
| +114 | +118 |
| +112 | +117 |
| +102 | +101 |
| +99 | +102 |
| +98 | +100 |
| +101 | +98 |
| +100 | +99 |
| +102 | +100 |
| +101 | +105 |
| +99 | |
| +98 | |
| +98 | |

37) Column → Jd / 18d. (Direct)

PL = 340 mm

| | |
|---|---|
| +112 | +98 |
| +104 | +99 |
| +105 | +100 |
| +96 | +98 |
| +101 | +103 |
| +98 | +97 |
| + | + |
| +99 | |
| +106 | |
| +96 | |

The Measurements on this page were taken on 27/1

34

TOWER B

27/01/2023

(28) Column → Gd | 21d

PL = 340mm

| | |
|---|---|
| +89 | +85 |
| +83 | +87 |
| +82 | +84 |
| +89 | +82 |
| +84 | +82 |
| +83 | +82 |
| +81 | +84 |
| +82 | |
| +83 | |

(29) Column → Jd | 22d

PL = 340mm

| | |
|---|---|
| +86 | +89 |
| +80 | +84 |
| +80 | +88 |
| +78 | +83 |
| +75 | +84 |
| +77 | +82 |
| +82 | |
| +79 | |

The Measurements on this page were taken on 29/1



TOWER B

27/01/2023

(39) Column → Nd | 22d (Dired)

PL = 340mm

| | |
|---|---|
| + | + |
| + | +96 |
| +116 | +94 |
| +84 | +87 |
| +84 | +89 |
| +81 | +86 |
| +84 | +87 |
| +80 | +84 |
| +81 | |
| +83 | |

(40) Colum → 2d | 23d

PL = 340mm

| | |
|---|---|
| +110 | +96 |
| +105 | +97 |
| +97 | +90 |
| +91 | +88 |
| +95 | +89 |
| +91 | +87 |
| +89 | +84 |
| +89 | |
| +87 | |

(41) Column. Gd | 24d

PL = 340mm

| | |
|---|---|
| +84 | +82 |
| +82 | +88 |
| +97 | +87 |
| +78 | +82 |
| +76 | +77 |
| +76 | +79 |
| +75 | +76 |
| +76 | |
| +75 | |

The Measurements on this page were taken on 29/1

Tower - B

27/01/2023

② Column → Jd/25d

PL = 340mm

| + | + |
|---|---|
| +89 | +92 |
| +88 | +107 |
| +87 | +92 |
| +85 | +91 |
| +88 | +88 |
| +89 | +86 |
| +95 | |
| +91 | |

③ Column → Nd/25d

PL = 340mm

| | |
|---|---|
| +99 | +108 |
| +94 | +99 |
| +92 | +99 |
| +119 | +98 |
| +98 | +91 |
| +86 | +84 |
| +87 | +82 |
| +87 | |
| +88 | |



The Measurements on this page were taken on ...27/1...

Tower (C)

27/01/2023

① slab → 4d/5d - Bd/Fd (Indirect)

| | |
|---|---|
| +92 | +105 +102 +92 +93 +91 |
| +125 | +97 +97 +77 +83 +92 |
| +161 | +117 +109 +104 +96 +88 |
| +98 | +95 +95 +95 +69 +95 |
| +116 | +107 +93 +122 +70 +80 |
| +76 | +99 +84 +86 +75 + |

UPVT

| | | |
|---|---|---|
| 52 | 52 | 54 |
| 50 | 54 | 58 |
| 50 | 52 | 53 |

RHT



The Measurements on this page were taken on ...27/1...

Tower - C

27/01/2023

② Slab → 3d-4d / 8d-Ed

| | | |
|---|---|---|
| 52 | 52 | 60 |
| 58 | 52 | 60 |
| 60 | 58 | 58 |

RHT

+84 +98 +88 +96 +96 +
+81 +87 +89 +88 +80 +
+92 +86 +92 +90 +87 +
+97 +83 +95 +87 +81 +
+80 +79 +90 +81 +71 +
+85 +72 +96 +80 +73 +

UPVT



The Measurements on this page were taken on 27/1

Tower - C

27/01/2023

③ Slab → 1d-2d / 4d-5d (Indirect)

+86 +82 +80 +77 +81 +69
+88 +82 +78 +89 +85 +85
+85 +84 +88 +78 +95 +80
+85 +92 +83 +79 +76 +86
+80 +90 +80 +76 +72 +68
+80 +75 +80 +82 +80 +76

UPVT

| | | |
|---|---|---|
| 56 | 58 | 58 |
| 60 | 58 | 58 |
| 52 | 52 | 54 |

RHT



The Measurements on this page were taken on 27/1

Tower C

27/01/2023

④ Slab → 6d - Ac / Dd - Qd C

| | | |
|---|---|---|
| 52 | 52 | 58 |
| 56 | 58 | 58 |
| 50 | 58 | 58 |

RHT

(Endirect)

+ 66 + 71 + 76 + 82 + 82 + 61
+ 76 + 72 + 84 + 98 + 92 + 95
+ 66 + 87 + 73 + 95 + 95 + 92
+ 76 + 97 + 77 + 92 + 88 + 86
+ 76 + 82 + 71 + 86 + 95 + 99

UPVT

The Measurements on this page were taken on 27/1



⑤ Slab - Pd - Nd / 6d - Ac

27/01/2023

+ 96 + 98 + db + db + db + db
+ 95 + 127 + 102 + 87 + 106 + 88
+ 95 + db + db + db + db + db
+ 84 + 89 + 88 + 96 + db + db
+ 84 + 98 + 99 + 91 + 90
+ 86 + 70 + 69 + 88 + 88

UPVT

| | | |
|---|---|---|
| 44 | 52 | 52 |
| 58 | 58 | 58 |
| 54 | 58 | 58 |

RHT

UPVT

Beam (4d) - Ed - Hd

PL - 830 mm

+ 91 + 93 + 93 + 96 + 92 + 88 + 88 + 90 + 89 + 87 + 88
+ 78 + 81 + 83 + 90 + 86 + 82 + 86 + 87 + 84 + 83 + 89

+ 85 + 88 + 92 + 92 + 93 + 94
+ 91 + 88 + 85 + 86 + 86 + 99



The Measurements on this page were taken on 27/1

27/01/2023.

Beam → Hd-Kd | 3d (direct)

P2 = 340 mm

3 + 81 + 78 + 80 + 78 + 77 + 78 + 79 + 83 + 83 + 85 +
:3 + 79 + 98 + 78 + 77 + 81 + 82 + 81 + 77 + 83 + 81 +

Beam → 2d | Fd - Bd (direct)

P2 = 340 mm.

85 + 93 + 93 + 84 + 85 + 88 + 82 + 82 + 91 + 92 + 93 + 96
81 + 84 + 86 + 83 + 80 + 85 + 83 + 85 87 + 92 + 97 + 94

Beam → 5d | Bd - Fd. (Direct)

P2 = 340 mm.

+ 91 + 90 + 95 + 88 + 92 + 86 + 89 + 88 + 93 + 93 + 94
+ 89 + 94 + 87 + 90 + 90 + 82 + 90 + 89 + 87 + 88 + 84

Beam → Hd / 5d - 6d (Direct)

P2 = 320 mm

+ 88 + 87 + 85 + 75 + 83 + 83 + 81 + 81 + 83 + 83
+ 86 + 86 + 83 + 82 + 81 + 86 + 83 + 82 + 84 + 85

The Measurements on this page were taken on 27/1 (33)

27/01/2023

+ 85 + 81 + 83 + 82 + 85 + 85
+ 85 + 87 + 86 + 84 + 82 + 83

## TOWER B (Basement)

Beam → 15d | Nd - 5d - Qd

P2 = 340 mm

+ 89 + 92 + 86 + 88 + 88 + 87 + 94 + 85 + 89 + 88 + 88 + 86
+ 89 + 90 + 88 + 86 + 88 + 88 + 93 + 90 + 87 + 87 + 84 + 88

+ 89 + 83 + 79 + 82 + 80 + 81 + 78 + 85 + 84
+ 87 + 85 + 81 + 76 + 83 + 84 + 83 + 82 + 83

Slab → 15d - 16d / Pd - Qd (Derived)

+ 98 + 76 + 75 + 74 + 63
+ 83 + 78 + 75 + 86 + 65
+ 68 + 72 + 72 + 75 + 77
+ 63 + 72 + 84 + 82 + 71
+ 116 + 110 + 78 + 105 + 81
+ 82 + 81 + 79 + 70 + 76

Pg no (34)

The Measurements on this page were taken on 27/1

28/01/2023

Tower C

Beam → Pd/6d-AC (Direct)

PL = 320mm

80 + 81 + 79 + 79 + 76 + 88 + 78 + 81 + 84 + 86 + 90 + 87
82 + 82 + 85 + 83 + 82 + 82 + 90 + 92 + 82 + 85 + 87 + 82

88 + 88 + 88 + 88 + 88
100 + 86 + 87 + 87 + 89

Tower B

Beam → Nd/25d-27d (Direct)

PL = 340mm

88 + 94 + 94 + 98 + 95 + 96 + 98 + 99 + 100 + 101
94

105 + 102 + 98 + 101 + 109 + 98 + 99 + 102 + 107



28/01/2023

Slab → Nd-Md / 25d-27d

PL = 300mm

167 + 185 + 178 + 115 + 115
141 + 141 + 121 + 132 + 138
129 + 134 + 134 + 146 + 112
125 + 157 + 132 + 148 + 138
138 + 144 + 168 + 146 + 165
168 + 186 + 138 + 168 + 125

UPVT

| | | |
|---|---|---|
| 52 | 52 | 52 |
| 50 | 52 | 50 |
| 52 | 52 | |

RHT

wer B

28/01/2023

Slab → 3d - 2d / 23d - 25d

| | | |
|---|---|---|
| 48 | 50 | 48 |
| 52 | 50 | 48 |
| 50 | 52 | 54 |

Beam → 2d / 23d - 25d (direct)

P2 = 340mm

91 + 88 + 86 + 87 + 98 + 88 + 87 + 89 + 90 + 95 + 91 + 90 + 90

109 + 89 + 91 + 89 + 100 + 87 + 86 + 84 + 85 + 97 + 87 + 99 + 92

+91 + 95 + 92
+98 + 91 + 86



Tower (B)

28/01/2023

Slab → 25d - 27d / 3d - 6d

| | | |
|---|---|---|
| 54 | 54 | 56 |
| 58 | 52 | 54 |
| 52 | 54 | 58 |

RHT

Tower (B)

Slab → 3d - 2d / 22d - 24d

P2 = 300mm

+ 108 + 120 + 131 + 138 + 137 + 123
+ 122 + 139 + 141 + 132 + 113 + 136
+ 109 + 131 + 122 + 127 + 115 + 115
+ 135 + 148 + 127 + 125 + 126
+ 123 + 121 + 137 + 146 + 128
+ 168 + 132 + 134 + 125 + 183

OPVT

| | | |
|---|---|---|
| 52 | 50 | 50 |
| 50 | 48 | 52 |
| 52 | 48 | 48 |

RHT

28/01/2023

## Tower B

Beam -> 2d | 22d - 22d

$\ell L = 350mm$

1 +98 +88 +95 +100 +105 +96 +93 +94 +110 +101 +98 +119
2 +97 +91 +91 +103 +89 +91 +94 +92 +106 +112 +99 +138
8 +97 +93 +94 +103 +94 +98 +98 +99 +125 +102 +110 +140

## Tower B

slab -> Nd - 9d | 16d - 18d

+116 +137 +141 +114 +100
+105 +130 +127 +138 +99
+99 +138 +104 +130 +90
+131 +126 +140 +118 +116
+126 +131 +132 +128 +116
+108 +122 +100 +134 +113

UPVT

| | | |
|---|---|---|
| 50 | 50 | 48 |
| 52 | 50 | 58 |
| 56 | 56 | 58 |

RHT



28/01/2023

## Tower (B)

Beam -> Nd - Pd / 16d

$P2 = 340mm$

+81 +97 +97 +100 +84 +95 +86 +100 +83 +80 +81 +94
+89 +94 +98 +97 +83 +94 +96 +98 +94 +96 +98 +95

+86 +89 +90 +91 +88
+89 +98 +98 +100 +94

26/01/23

1) Lift wall (G.F) ~~G.b - 9b~~ G.b - 9b

-236, -210, -242, -212, -248, -231, -277, -307, -313

2) Staircase waist slab - bottom FF → LVL

-394, -443, -464, -397, -407, -432, -460, -400, -390

## Tower B - Ground Floor

28/01/2023

① Slab - UPVT → Bb - Ab / 1b - 2b  P2 = 300mm

| | | | | | |
|---|---|---|---|---|---|
| +80 | +134 | +80 | +107 | +81 | +119 |
| +116 | +116 | +90 | +116 | +99 | +113 |
| +130 | +116 | +92 | +96 | +135 | +114 |
| +132 | +128 | +96 | +99 | +92 | +95 |
| +141 | +138 | +96 | +87 | +104 | +106 |

UPVT

| | | |
|---|---|---|
| 26 | 32 | 28 |
| 24 | 30 | 30 |
| 30 | 26 | 30 |

RHT

② Beam → UPVT → Bb / 1b - 2b

P2 = 240mm

+69 +68 +69 +70 +66 +67 +67 +70 +68 +70 +65 +65

Tower B - Ground Floor 28/01/2023

1) Column → UPVT → Bb/2b P2 = 780 mm

+ 217 + 241
+ 252 + 226
+ 228 + 229
+ 201 + 217
+ 222 + 224
+ 213 + 217
+ 209 + 222
+ 205 + 215
+ 200 + 220

Direct Method

+ 99
+ 98
+ 184

2) Column → UPVT → Ab/1b P2 = 1060 mm



Tower - B - Ground Floor 28/01/2023

3) Column - ~~B1/2b~~ 5b/Lb

P2 = 470 mm

+ 316 + 500 + 481 + 306 + 181
+ 568 + 875 + 741 + 248 + 153
+ 155 + 362 + 352 + 389 + 151
+ 149 + 171 + 251 + 305 + 356
+ 160 + 644 + 346 + 348 + 258
+ 380 + 385 + 427 + 130 + 156
+ 152 + 254 + 352 + 136 + 136
+ 182 + 661 + 299 + 205 + 203
+ 223 + 337 + 216 + 318 + 294
+ 206 + 251 + 159 + 321 + 207
+ 130 + 189 + 239 + 203 + 226
+ 346 + 235 + 159 + 151 +

# CONCRETE CORE EXTRACTION

21/01/2023

## Basement Floor - Tower B

1. Column → Kb/9b ✓
2. Column → ~~2b/10b~~ Lb/1b ✓
3. Column (Rear Wall) → Eb/Fb - 2b/3b ✓

23/01/2023

4. Column → Cb/1b ✓
5. Beam → 1b/~~Cb-Kb~~ Fb - Gb ✓
6. Column → Cb/3b ✓
7. Column → Mb/2b ✓
8. Beam → Eb/10b-11b ✓
9. Column → Cb/12b ✓
10. Beam → 10b/Ab - Eb ✓
11. Column → Bb/8b ✓ ②
12. Beam → Ab/9b - 10b ✓
13. Beam → 9b - 10b / Mb ✓

Tower (B) Rebound Hammer 24/01/2023

slab

1) slab Ab-Bb/1b-2b

| | | |
|---|---|---|
| 52 | 54 | 54 |
| 48 | 56 | 54 |
| 48 | 56 | 58 |

4) Cb-Db/ab-10b

| | | |
|---|---|---|
| 54 | 58 | 58 |
| 58 | 56 | 58 |
| 56 | 58 | 56 |

2) slab Cb-Eb/1b-2b

| | | |
|---|---|---|
| 52 | 54 | 58 |
| 56 | 54 | 50 |
| 52 | 52 | 56 |

5) Slab-11b-12b/Ab-Bb

| | | |
|---|---|---|
| 52 | 54 | 52 |
| 56 | 56 | 54 |
| 58 | 56 | 58 |

3) slab Cb-Eb/2b-3b

| | | |
|---|---|---|
| 52 | 56 | 58 |
| 54 | 58 | 54 |
| 52 | 54 | 50 |

6) Slab-11b-12b/Bb-Cb

| | | |
|---|---|---|
| 60 | 60 | 58 |
| 60 | 58 | 58 |
| 58 | 60 | 60 |

24/01/2023

7) Slab → 11b-12b – Cb-Eb

| | | |
|---|---|---|
| 58 | 54 | 56 |
| 54 | 60 | 56 |
| 66 | 60 | 68 |

8) Slab → 11b-12b / Eb-Hb

| | | |
|---|---|---|
| 50 | 50 | 60 |
| 58 | 56 | 58 |
| 56 | 58 | 56 |

9) Slab → 11b-12b / Gb-Kb

| | | |
|---|---|---|
| 52 | 54 | 52 |
| 54 | 48 | 46 |
| 50 | 54 | 54 |

10) Slab → 11b – 12b / Kb-Zb

| | | |
|---|---|---|
| 54 | 52 | 54 |
| 56 | 54 | 50 |
| 50 | 50 | 52 |

24/01/2023

(11) Slab 11b-12b / Mb-Lb

| | | |
|---|---|---|
| 56 | 58 | 54 |
| 58 | 58 | 56 |
| 60 | 56 | 58 |

26/01/2023

(12) Slab → 9b-10b / Ab-Bb (RHT)

| | | |
|---|---|---|
| 56 | 50 | 56 |
| 56 | 56 | 54 |
| 54 | 56 | 58 |

(13) Slab → 5b-9b / Ab-Bb (RHT)

| | | |
|---|---|---|
| 54 | 60 | 58 |
| 58 | 60 | 64 |
| 50 | 58 | 60 |

(14) Slab → 2b-3b / Ab-Bb (RHT)

| | | |
|---|---|---|
| 60 | 58 | 64 |
| 58 | 58 | 58 |
| 60 | 60 | 60 |

The Measurements on this page were taken on 24/1

(3)

26/01/2023

5) slab → 1b/2b - Kb/Hb

| | | |
|---|---|---|
| 58 | 58 | 50 |
| 58 | 50 | 58 |
| 56 | 58 | 58 |

6) slab → 1b/2b – 2b/Kb

| | | |
|---|---|---|
| 56 | 56 | 58 |
| 58 | 50 | 58 |
| 56 | 58 | 56 |

7) Slab → 3b-4b/ Lb-Hb

| | | |
|---|---|---|
| 50 | 40 | 56 |
| 48 | 40 | 40 |
| 54 | 48 | 52 |

8) Slab → 5b-9b/ Lb-Mb

| | | |
|---|---|---|
| 60 | 58 | 60 |
| 60 | 60 | 60 |
| 60 | 60 | 60 |

The Measurements on this page were taken on ..26/1/..



~~26/01/2023~~
26/01/2023

(19) Slab → 8b-10b/Lb-Mb

| | | |
|---|---|---|
| 52 | 54 | 58 |
| 58 | 60 | 54 |
| 52 | 54 | 60 |

(20) slab → 9b-10b/Kb-2b

| | | |
|---|---|---|
| 58 | 58 | 54 |
| 58 | 56 | 56 |
| 54 | 56 | 58 |

(21) slab → 2b-3b/Kb-Hb

| | | |
|---|---|---|
| 60 | 58 | 58 |
| 60 | 58 | 56 |
| 58 | 60 | 58 |

The Measurements on this page were taken on ..26/1/..

Tower B - Ground Floor

30/01/2023

(5) Beam - (UPVT) - 5b/2b-Hb - Direct

PL = 270 mm

+74 +90 +86 +74.4 +85

(6) Column - (UPVT) - 1b/Kb - Direct

PL = 430 mm

+104 +110 +112 +113
+106 +107 +104 +113
+118 +105 +110 +117
+98 +99 +96 +111
+116 +107 +104 +117
+114 +111 +108 +109
+99 +99 +100 +115
+104 +105 +102 +105
+101 +98 +100 +101
+103 +105 +101 +116
+99 +100 +98 +105
+85 +86 +124 +113

Tower B - Ground Floor 30/01/2023

Column → UPVT → 2b/2b PL = 780mm

| | |
|---|---|
| +208 | +209 |
| +209 | +207 |
| +208 | +207 |
| +204 | +191 |
| +205 | +201 |
| +207 | +208 |
| +213 | +209 |
| +214 | +216 |
| +207 | +206 |
| +207 | +197 |
| +200 | +202 |

Slab → UPVT → 1b-2b/Hb-kb PL = 300mm

| | |
|---|---|
| +73 | +73 +76 +76 +72 +70 |
| +77 | +75 +72 +82 +84 +80 |
| +69 | +82 +83 +77 +76 +71 |
| +68 | +75 +70 +70 +77 +80 |
| +62 | +61 +58 +59 +58 +57 |

UPVT

| | | |
|---|---|---|
| 30 | 32 | 30 |
| 30 | 24 | 30 |
| 30 | 30 | 32 |

RHT



Tower (B) Ground Floor 30/01/2023

(9) Beam → UPVT - ~~kb~~-1b/2b PL = 230mm

+60 +61 +60 +64 +67 +65 +68 +68 +64.

(10) Beam → UPVT - 1b/kb-2b PL = 230mm

+58 +60 +60 +59 +58 +58

(11) Column → UPVT - 1b/cb PL = 440mm

| | | |
|---|---|---|
| +124 | +127 | +126 |
| +127 | +125 | +113 |
| +117 | +128 | +126 |
| +122 | +126 | +121 |
| +118 | +120 | +121 |
| +121 | +118 | +116 |
| +113 | +112 | +119 |
| +121 | +116 | +116 |
| +116 | +118 | +103 |
| +123 | +125 | +122 |

ower B: Ground Floor 30/01/2023

) Column → Cb-2b - UPVT

P2 = 105mm

| |
|---|
| +437 |
| +434 |
| +447 |
| +489 |
| +447 |
| +480 |
| +437 |

) Column → Bb-2b - UPVT P2 = 780mm

| | |
|---|---|
| +212 | +190 |
| +211 | +222 |
| +216 | +207 |
| +238 | +225 |
| +259 | +226 |
| +237 | +236 |
| +232 | +230 |
| +228 | +228 |
| +214 | +218 |
| +211 | +223 |
| +232 | +200 |



Block (B) Ground Floor 30/01/2023

(14) Slab → RHT - Bb-Cb / 1b-2b

| | | |
|---|---|---|
| 28 | 28 | 30 |
| 30 | 28 | 28 |
| 30 | 28 | 30 |

(15) Column → UPVT - 8b - Bb P2 = 450mm

| | | | |
|---|---|---|---|
| +123 | +116 | +119 | +121 |
| +123 | +121 | +123 | +124 |
| +118 | +116 | +119 | +119 |
| +123 | +124 | +129 | +126 |
| +121 | +118 | +123 | +123 |
| +119 | +116 | +123 | +118 |
| +113 | +116 | +115 | +113 |
| +109 | +106 | +115 | +112 |
| +116 | +138 | +128 | +132 |
| +138 | +146 | +147 | +145 |
| +132 | +120 | +127 | +128 |

Tower (B) Ground Floor 30/01/2023

7) Slab UPVT - Ab-Bb / 9b-10b D2 = 300mm

+ 70 + 72 + 73 + 75 + 62
+ 63 + 71 + 71 + 68 + 57
+ 64 + 64 + 88 + 69 + 59
+ 62 + 67 + 73 + 69 + 56
+ 68 + 70 + 68 + 65 + 52
+ 62 + 64 + 69 + 70 + 57

} UPVT

| | | |
|---|---|---|
| 30 | 30 | 32 |
| 32 | 32 | 34 |
| 30 | 32 | 32 |

RHT

Column → UPVT → 10b / Ac - Bc D2 = 300mm

+ 85 + 79 + 83 + 84 + 85 + 80 + 78 + 82 + 84 + 80
+ 83 + 84 + 77 + 87 + 76 + 83 + 84 + 72 + 87 + 78
+ 84 + 80 + 81 + 79 + 87 + 82 + 79 + 86 + 79 + 84
+ 78 + 80 + 84 + 70 + 77 + 77 + 73 + 70 + 69 + 74
+ 83 + 83 + 84 + 81 + 82 + 84 + 84 + 80 + 88 + 83
+ 82 + 86 + 77 + 78 + 79 + 83 + 79 + 82 + 82 + 77
+ 84 + 78 + 82 + 77 + 79 + 79 + 75 + 74 + 85 + 75
+ 77 + 76 + 74 + 71 + 74 + 85 + 78 + 79 + 79 + 81
+ 77 + 75 + 77 + 73 + 77 + 76 + 73 + 75 + 82
+ 73 + 76 + 76 + 77 + 75 + 80 + 77 + 96 + 93
+ 110 + 129 + 118 + 105 + 64 + 84 + 87 + 89 + 78 + 83
+ 122 + 113 + 125 + 128 + 135 + 133 + 92 + 89 + 88 + 82

L3

Tower (B) Ground Floor 30/01/2023

(18) Beam → UPVT → 8b / Ab-Bb (Direct)

D2 = 230mm

+ 59 + 60 + 61 + 59 + 58

(19) Beam → UPVT → 10b / Bb - Cb (Direct)

D2 = 230mm

+ 58 + 60 + 59 + 63 + 59 + 60 + 64

(20) Slab → UPVT → 11b - 12b / Cb - Bb

D = 300mm.

+ 84 + 76 + 86 + 94 + 85
+ 93 + 85 + 94 + 92 + 67
+ 78 + 79 + 84 + 86 + 73
+ 78 + 74 + 80 + 70 + 88
+ 65 + 77 + 85 + 75 + 75
+ 61 + 80 + 115 + 124 + 84

} UPVT

| | | |
|---|---|---|
| 32 | 32 | 28 |
| 32 | 26 | 24 |
| 26 | 26 | 26 |

RHT

L3

Tower B Ground Floor 30/01/2023

1) Column -> UPVT -> 12b / Cb (Correct)

P2 = 450mm

| | | | |
|---|---|---|---|
| +105 | +107 | +109 | +db |
| +db | +108 | +109 | +103 |
| +db | +95 | +99 | +97 |
| +db | +112 | +113 | +116 |
| +113 | +105 | +105 | +119 |
| +116 | +111 | +114 | +116 |
| +114 | +106 | +107 | +111 |
| +112 | +108 | +111 | +109 |
| +114 | +105 | +116 | +107 |
| +112 | +105 | +155 | +819 |



Tower B Basement Floor 30/01/2023

## Corbels

① Corbel -> UPVT -> ~~3b | Bb - Ab~~ 10b | Mb - Lb

| | |
|---|---|
| +db | +db |
| +db | +dd |
| +113 | +116 |
| +112 | +142 |

P2 = 300 mm

② Corbel -> UPVT -> ~~Bb | Ab - Bb~~ 3b | 2b - Mb

| | |
|---|---|
| +118 | +180 |
| +269 | +121 |
| +253 | +203 |

P2 = 290mm

③ Corbel -> UPVT -> ~~12b | Ab~~ Mb | 1b

| | |
|---|---|
| +94 | +97 |
| +89 | +91 |

P2 = 380 mm

④ Corbel -> UPVT -> ~~12b | Ab~~ Mb | 1b

| | |
|---|---|
| +102 | +107 |
| +110 | +103 |

P2 = 400 mm

Tower B Basement Floor 30/01/2023

) Corbel → UPVT → 12b/Cb Kb - 1b

| | |
|---|---|
| +117 | +116 |
| +111 | +120 |

PL = 440mm

) Corbel → UPVT → 12b/Kb 1b/Bb

| | |
|---|---|
| +100 | +107 |
| +99 | +110 |

PL = 440mm

) Corbel → UPVT → 12b/Mb 1b/Ab

| | |
|---|---|
| +91 | +91 |
| +89 | +98 |

PL = 400 mm

) Corbel → UPVT → 12b/Mb 1b/Ab

| | |
|---|---|
| +97 | +97 |
| +104 | +90 |

PL = 380 mm

) Corbel → UPVT → 10b/Zb-Nb 3b/Ab-Bb

| | |
|---|---|
| +db | +326 |
| +db | +db |
| +160 | +199 |

PL = 300

(16)

Tower B Basement Floor 30/01/2023

⑩ Corbel → UPVT - 3b/Zb-Nb 10b/Ab-Bb

| | |
|---|---|
| +77 | +72 |
| +76 | +76 |
| +75 | +72 |

PL = 290

Tower C Basement Floor

① Corbel → UPVT - 3c/Ac 10c/Mc

| | |
|---|---|
| +92 | +88 |
| +89 | +85 |
| +89 | +81 |

PL = 320mm

② Corbel → UPVT - 10c/Ac 3c/Mc

| | |
|---|---|
| +149 | +148 |
| +db | +128 |
| +82 | +db |

PL = 320mm.

③ Corbel → UPVT - 11c/Ac 2c/Mc

| | |
|---|---|
| +103 | +103 |

PL = 320mm

(17)

7) Corbel → ~~RC~~ AC - UPVT 1c/4C

| | |
|---|---|
| +107 | +133 |
| +107 | +110 |

P2 = 420mm

8) Corbel → UPVT → ~~12C/Cc~~ 1c/KC

| | |
|---|---|
| +db | +118 |
| +db | +157 |
| +106 | +95 |

P2 = 330mm

9) Corbel → UPVT → Cc/1c

| | |
|---|---|
| +91 | +96 |
| +90 | +90 |
| +86 | +87 |

P2 = 330mm

10) Corbel → UPVT → 1c/Ac

| | |
|---|---|
| +92 | +126 |
| +100 | +89 |

P2 = 340mm





8) Corbel → UPVT → 1c/Ac.

| | |
|---|---|
| +87 | |
| +112 | |

P2 = 340mm

9) Corbel → UPVT — 3c/Ac

| | |
|---|---|
| +88 | +85 |
| +84 | +91 |
| +88 | +85 |

P2 = 340mm

10) Corbel → UPVT — 10c/Ac

| | |
|---|---|
| +82 | +79 |
| +77 | +79 |
| +81 | +76 |

P2 = 340mm

Tower - C. Rebound Hammer. 24/01/2023

Slab: (RHT)

① slab - Kc-Lc / 3c-4c

| | | |
|---|---|---|
| 50 | 50 | 58 |
| 60 | 50 | 60 |
| 50 | 50 | 58 |

④ slab → Lc-Mc / 3c-4c

| | | |
|---|---|---|
| 56 | 58 | 58 |
| 60 | 58 | 58 |
| 60 | 58 | 60 |

② slab - Kc-Lc / 2c-3c

| | | |
|---|---|---|
| 50 | 54 | 56 |
| 58 | 56 | 58 |
| 60 | 58 | 50 |

⑤ slab → Lc-Mc / 2c-3c

| | | |
|---|---|---|
| 60 | 54 | 62 |
| 56 | 52 | 52 |
| 56 | 54 | 54 |

③ Slab - Kc-Hc / 2c-3c

| | | |
|---|---|---|
| 58 | 60 | 50 |
| 50 | 50 | 60 |
| 60 | 60 | 58 |

⑥ slab → Lc-Mc / 8c-6c

| | | |
|---|---|---|
| 54 | 58 | 56 |
| 52 | 52 | 56 |
| 56 | 54 | 56 |

24/01/23

4) slab → 2c-Mc / 9c-10c

| | | |
|---|---|---|
| 56 | 56 | 58 |
| 54 | 56 | 56 |
| 54 | 56 | 56 |

5) slab → 2c-Kc / 9c-10c

| | | |
|---|---|---|
| 56 | 56 | 56 |
| 56 | 58 | 58 |
| 58 | 58 | 60 |

1) slab → Kc-2c / 2c-2c

| | | |
|---|---|---|
| 58 | 60 | 60 |
| 50 | 50 | 58 |
| 60 | 62 | 58 |

3) slab → Ec-Hc / 2c-2c

| | | |
|---|---|---|
| 58 | 60 | 58 |
| 50 | 58 | 60 |
| 58 | 58 | 58 |



24/10/23

11) slab → Ac-Bc / 2c-3c

| | | |
|---|---|---|
| 56 | 58 | 56 |
| 58 | 58 | 58 |
| 58 | 58 | 58 |

26/10/2023

12) slab → 10c-11c / 2c-Mc (RHT)

| | | |
|---|---|---|
| 50 | 54 | 50 |
| 56 | 58 | 56 |
| 54 | 54 | 58 |

13) slab → 10c-11c / Kc-2c (RHT

| | | |
|---|---|---|
| 60 | 58 | 54 |
| 50 | 52 | 64 |
| 60 | 54 | 58 |

26/01/2023

(14) Slab → Hc-12c/Kc-2c (RWT)

| | | |
|---|---|---|
| 60 | 60 | 58 |
| 58 | 50 | 50 |
| 52 | 60 | 58 |

) Slab → 10c-11c/Cc-Ec

| | | |
|---|---|---|
| 56 | 56 | 56 |
| 60 | 52 | 58 |
| 54 | 56 | 60 |

) Slab → 10c-11c/Bc-Cc

| | | |
|---|---|---|
| 60 | 60 | 58 |
| 52 | 54 | 58 |
| 58 | 58 | 54 |

The Measurements on this page were taken on 26/1



26/01/2023

(17) Slab → 9c-10c/Bc-Cc

| | | |
|---|---|---|
| 56 | 52 | 54 |
| 54 | 58 | 58 |
| 56 | 52 | 52 |

(18) Slab → 3c-4c/Bc-Cc

| | | |
|---|---|---|
| 60 | 58 | 54 |
| 58 | 58 | 58 |
| 60 | 58 | 62 |

(19) slab → 9c-10c/Bc-Bc

| | | |
|---|---|---|
| 50 | 54 | 58 |
| 52 | 54 | 56 |
| 50 | 52 | 54 |

(20) slab → 2c-3c/Bc-Cc

| | | |
|---|---|---|
| 58 | 50 | 50 |
| 56 | 50 | 52 |
| 54 | 56 | 54 |

The Measurements on this page were taken on 26/1

26/01/2023

(21) slab → 2C-3C / BC-CC

| | | |
|---|---|---|
| 52 | 50 | 52 |
| 54 | 58 | 58 |
| 52 | 54 | 52 |

The Measurements on this page were taken on ...21/1.....

31/01/2023

Tower - B First Floor

Flat (0104)

1) Column -> Nb/~~Nb~~ 12b - Flat No - 0104

| | |
|---|---|
| +95 | +91 |
| +92 | +82 |
| +77 | +105 |
| +87 | +100 |
| +73 | +101 |
| +95 | +98 |

Cover mob = 44 - 48

PL = 300mm

(0104)

2) column -> Nb 11b -> Flat - (0104)

| | |
|---|---|
| +79 | +61 |
| +62 | +75 |
| +73 | +75 |
| +66 | +68 |
| +55 | +66 |

PL = 300mm

(0104)

3) Beam -> Qb 28 / 11b - 10b - 8b

+64 +64 +67 +67

PL = 250 mm

Bathroom

| | | |
|---|---|---|
| 34 | 38 | 32 |
| 38 | 34 | 34 |
| 30 | 32 | 32 |

Col 33mm - 38mm

RHT

The Measurements on this page were taken on 31/1

at NO (0104) First Floor 31/01/2023

Bath Room

| | | |
|---|---|---|
| 38 | 36 | 36 |
| 36 | 34 | 38 |
| 38 | 40 | 38 |

1)

Flat NO (101) 11b-12b/Bb-Ab

RHT

| | | |
|---|---|---|
| 34 | 38 | 36 |
| 38 | 32 | 34 |
| 36 | 36 | 34 |

C.M = 34 to 35

(101)

UPVT - Column - 11b/Ab (Indirect)

P2:250

| | |
|---|---|
| +69 | +81 |
| +63 | +60 |
| +89 | +72 |

C.M = 48 - 50 mm

3)

slab - RHT = 10b-9b/Bb-Ab

| | | |
|---|---|---|
| 34 | 36 | 38 |
| 32 | 34 | 36 |

RHT

The Measurements on this page were taken on 31/1

2

Flat NO (0101) First Floor 31/01/2023

8) - Column → Cover meter - 11b/Ab

Cover meter - ~~50-52mm~~ 44-48mm

Flat NO (0101)

Slab → RHT - Ab/Bb-12b-11b

| | | |
|---|---|---|
| 28 | 32 | 32 |
| 36 | 38 | 32 |
| 34 | 40 | 38 |

Flat (0101)

Beam → UPVT - 11b-10b/Cb

Direct

+58 +66 +69 +76 +70 P2 = 240 mm

Flat (0101)

Column → UPVT - 9b-10b/Cb

S.W

+77 +85 +83 +67 +69

+74 +83 +58 +78 +72

+82 +79 +79 +82 +84

+82 +77 +78 +85 +82

Semi

P2 = 300 mm

C.M = 41 to 47 mm

The Measurements on this page were taken on 31/1

3

First Floor 31/01/2023

Flat NO - 0102

Column -> 2b / Ab Indirect

| | |
|---|---|
| +67 | +67 |
| +67 | +61 |
| +60 | +62 |
| +60 | +61 |
| +69 | +70 |

PL = 300mm

Cover = 42 - 43mm

0102

Column -> 8b / 9b / Cb (Semi direct)

300 / 150

Semi direct

| | |
|---|---|
| +102 | +125 |
| +99 | +150 |
| +54 | +87 |
| +55 | +85 |
| +54 | +89 |

Cover = 50 - 55 mm

Slab -> 6b - 9b / Bb

| | | |
|---|---|---|
| 34 | 32 | 32 |
| 32 | 32 | 30 |
| 32 | 30 | 32 |

RHT

| | | |
|---|---|---|
| 40 | 42 | 44 |
| 40 | 40 | 42 |
| 40 | 38 | 40 |

The Measurements on this page were taken on 31/1

(4)

First Floor 31/01/2023

Flat NO 0103

Column - 11b / Ab

| | |
|---|---|
| +84 | +71 |
| +75 | +76 |
| +76 | +75 |
| +82 | +76 |
| +77 | +79 |

Cover - 38 - 44

PL: 300

0103

Slab -> RHT - 8b - 9b / Cb - Ab

| | | |
|---|---|---|
| 30 | 32 | 32 |
| 32 | 34 | 34 |
| 32 | 30 | 34 |

Beam -> Out -> Cb / 10b - 11b

+73 +64 +68 +73 +70

PL = 260mm

The Measurements on this page were taken on 31/1

(5)

(0103) First Floor 31/01/2023

Slab - 6b - ab/Bb

| | | |
|---|---|---|
| 32 | 36 | 32 |
| 30 | 32 | 32 |
| 36 | 34 | 32 |

RHT

First Floor - (Common Area)

Beam - UDVT - Cb - Db/4b PL = 230 mm

+61 +77 +62 +78 Cover - 29-42mm

Slab

Beam - UDVT - 4b-7b/Db-Cb

Cover - 40 - 45mm

Sola'Beam - 5b - Kb/9b -

+75 +78 +57 +61 + PL = 230 mm

The Measurements on this page were taken on 31/1



First Floor Common Area 31/01/2023

Column - 10b-11b / Hb

| | | | | |
|---|---|---|---|---|
| +89 | +89 | +91 | | |
| +77 | +84 | +76 | | |
| +104 | +103 | +83 | | |
| +79 | +77 | +72 | | |

PL = 300

Cover - 45-58mm

Column - 10b-11b/Eb

| | | | | |
|---|---|---|---|---|
| +89 | +85 | +97 | +74 | +75 |
| +137 | +122 | +76 | +76 | +72 |
| +90 | +76 | +75 | +74 | +61 |

Cover - 48-60mm

PL = 300

Beam - 10b-Eb/10b-9b (Above Stair)

(Semi direct)

+48 +43 +46 +52 +44

Slab → 9b-10b / Fb-Gb

| | | |
|---|---|---|
| 34 | 34 | 40 |
| 42 | 40 | 34 |
| 38 | 34 | 32 |

RHT

The Measurements on this page were taken on 31/1

31/01/2023

ab 3b-4b / Fb-Gb

| | | |
|---|---|---|
| 32 | 34 | 34 |
| 32 | 32 | 32 |
| 32 | 32 | 34 |

RHT

+55
+63
+64
+62

Semi direct

Column - 10-11b / Eb

## 2nd Floor (Common Area)

Column → 10b-11b/Hb (Indirect)

| | | |
|---|---|---|
| +152 | +119 | +114 |
| +92 | +95 | +95 |
| +117 | +82 | +80 |
| +70 | +79 | +64 |
| +79 | +92 | +86 |

P2 300

Cover - 57 - 64 mm

The Measurements on this page were taken on 31/1

Column → 10b-11b / Eb (Indirect)

| | | |
|---|---|---|
| +88 | +88 | +85 |
| +73 | +81 | +77 |
| +78 | +79 | +75 |
| +85 | +75 | +74 |

300

Cover - 52 - 68



31/01/2023

2nd Floor - Common Area.

Column → 9b-11b/Hb

| |
|---|
| +55 |
| +50 |
| +58 |
| +52 |
| +49 |

Semi direct

Column → Beam → 9b / Cb-Db (Direct)

+60 +59 +70 +62 +60

P2 = 240 mm

Column - 11b / 2b-4b

Beam - ~~10b-11b~~ / 3b-4b / Hb

+58 +56 +60 +57

P2 = 230 mm

The Measurements on this page were taken on 31/1

31/01/2023

Beam - Kb-Jb / Ub-[illegible] (Direct)

+70 +58 +73 +72 PL = 230mm

---

2nd Floor → Flat No (202)

Beam → 2b-3b / Cb (Direct)

+72 +73 +74 +75 +79 PL = 270mm

Cover = 28-42

Slab → 2b-3b / Cb-Bb

| | | |
|---|---|---|
| 32 | 32 | 32 |
| 30 | 30 | 30 |
| 34 | 32 | 32 |

RHT Cover 34 - 44mm

The Measurements on this page were taken on [illegible]



(B) 2nd Floor - Flat - (202)

31/01/2023

Column → Ab-2b / InDirect

| | |
|---|---|
| +62 | +66 |
| +68 | +65 |
| +65 | +57 |
| +62 | +61 |

PL = 300mm

Cover = 50-57 mm

Flat - (202)

Slab → 2b-1b / Cb-Bb

| | | |
|---|---|---|
| 32 | 32 | 32 |
| 30 | 32 | 28 |
| 34 | 34 | 32 |

RHT

Slab → 4b-5b / Ab-Bb (Flat 202)

| | | |
|---|---|---|
| 32 | 32 | 30 |
| 32 | 34 | 30 |
| 32 | 32 | 32 |

RHT

The Measurements on this page were taken on [illegible]

Tower B - 3rd Floor. 01/02/2023

Flat NO - 0302.

Beam - Cb | 2b-3b (Gb25) (Direct)

| | | | | |
|---|---|---|---|---|
| +78 | +80 | +78 | +83 | +89 |

P2 = 280 mm

Flat NO - 0302

Column - Ab | 2b (Indirect)

| | |
|---|---|
| +71 | +68 |
| +65 | +72 |
| +80 | +83 |
| +66 | +65 |
| +94 | +92 |

Cover - 47 - 49mm

Slab - 2b-3b - Cb-Bb

| | | |
|---|---|---|
| 34 | 38 | 36 |
| 34 | 34 | 34 |
| 36 | 34 | 33 |

RHT

The Measurements on this page were taken on ...02...

12

Tower B 3rd Floor Flat 0302 01/02/23

Column - Bb | 2b (Indirect)

| | |
|---|---|
| +81 | +88 |
| +86 | +89 |
| +98 | +75 |
| +82 | +77 |
| +82 | +71 |

Cover = 59 - 63mm

Slab - Sb-8b | Ab-Bb Flat 0302

| | | |
|---|---|---|
| 34 | 32 | 32 |
| 32 | 30 | 32 |
| 34 | 34 | 32 |

RHT

Slab - Cb-Bb | 1b-2b (0302)

| | | |
|---|---|---|
| 36 | 34 | 32 |
| 36 | 34 | 32 |
| 34 | 32 | 36 |

RHT

The Measurements on this page were taken on ...02...

13

Tower (B) 3rd Floor Flat No 0303 01/02/2023

Beam - UPVT - 2b/3b/Kb

+92 +94 +109 +102 +100

PL = 280 mm

Cover - 34 - 40 mm

Slab - RHT - 4b - 3b/Kb

| | | |
|---|---|---|
| 32 | 32 | 32 |
| 32 | 32 | 32 |
| 32 | 33 | 33 |

RHT

Column - 2b/Kb

Cover - 34 - 44 mm

were taken on 01/02



Tower B 3rd Floor - Flat 0303 01/02/2023

Column → Kb/3b (Indirect)

Cover - 39 - 44 mm

| | |
|---|---|
| +73 | +81 |
| +75 | +84 |
| +69 | +86 |
| +84 | +81 |
| +68 | +64 |

Slab → 3b - 4b / Nb - 2b

| | | |
|---|---|---|
| 34 | 38 | 38 |
| 32 | 32 | 36 |
| 34 | 32 | 32 |

RHT

Column → Nb/2b

| | | |
|---|---|---|
| +82 | +79 | +66 |
| +72 | +96 | +93 |
| +73 | +92 | +92 |
| +66 | +80 | +85 |
| +73 | +64 | +68 |

39 - 44 mm

were taken on 01/02

01/02/2023

Tower (B) 3rd Floor Flat - No 0303

Slab - RHT - Kb-Lb / Ib-Lb

| | | |
|---|---|---|
| 30 | 32 | 30 |
| 30 | 30 | 30 |
| 28 | 30 | 28 |

RHT

Tower (B) 3rd Floor

lat - NO - (0304)

Beam - OPVT - 10b - 11b / Kb

+66 +73 +69 +72 +77 +68 PL = 250mm

slab - RHT - Lb - Kb / 10b - 11b

| | | |
|---|---|---|
| 38 | 32 | 34 |
| 32 | 32 | 32 |
| 34 | 36 | 34 |

RHT

The Measurements on this page were taken on 01/02

(16)

Tower (B) - Flat NO - (0304)

01/02/2023

Column - 11b / Mb - (Indirect)

| | | |
|---|---|---|
| +76 | +96 | +88 |
| +90 | +85 | +77 |
| +83 | +93 | +80 |
| +72 | +86 | +101 |
| +92 | +89 | +80 |

Cover = 48 - 56 mm

column - 10b / Kb - (Indirect)

| | | |
|---|---|---|
| +92 | +79 | +75 |
| +77 | +83 | +95 |
| +86 | +86 | +78 |
| +74 | +72 | +75 |
| ~~+76~~ | | |

Cover = 54 - 58 mm

The Measurements on this page were taken on 01/02

Slab - 10b - 9b / Lb - Kb slab 10b - 11b / Mb - Lb

| | | |
|---|---|---|
| 36 | 32 | 32 |
| 38 | 32 | 34 |
| 34 | 32 | 34 |

RHT

| | | |
|---|---|---|
| 34 | 40 | 36 |
| 32 | 32 | 36 |
| 32 | 38 | 34 |

RHT

(17)

01/02/2023

Tower (B) Flat No - 0301

Beam → UPVT - 11b - 10b / Cb

+69 +71 +66 +67 +69

PL = 260 mm

Slab → RHT - 10b - 11b / Cb - Bb

| | | |
|---|---|---|
| 33 | 32 | 34 |
| 36 | 38 | 34 |
| 32 | 32 | 30 |

RHT

Column - 11b / Ab

| | | | |
|---|---|---|---|
| +95 | +76 | +64 | +70 |
| +70 | +76 | +63 | +61 |
| +71 | +78 | +96 | +84 |
| +77 | +83 | +84 | +86 |
| +79 | +64 | +99 | +100 |

Cover = 48 - 51 mm

The Measurements on this page were taken on 9/12



01/02/2023

Column → 10b / Cb (Indirect)

| | |
|---|---|
| +67 | +77 |
| +86 | +87 |
| +82 | +93 |
| +98 | +74 |
| +99 | +100 |

PL 300

Cover = 55 - 60 mm

Slab → Cb / Bb - 9b / 10b

| | | |
|---|---|---|
| 32 | 32 | 30 |
| 32 | 38 | 30 |
| 32 | 32 | 34 |

RHT

3rd Floor - Common Area

Column - 11b - 9b / Ab

| | | | |
|---|---|---|---|
| +75 | | | |
| +60 | | | |
| +55 | | | |
| +54 | | | |
| +53 | | | |
| +52 | | | |

PL 200 / 250

Semidirect

Cover = 51 - 58 mm

| | | | |
|---|---|---|---|
| +76 | +73 | +79 | +85 |
| +64 | +79 | +78 | +95 |
| +133 | +95 | +82 | +83 |
| +85 | +89 | +89 | +100 |
| +86 | +82 | +91 | +91 |
| +100 | +92 | +100 | +102 |

Indirect

The Measurements on this page were taken on 9/02

Tower B 3rd Floor Common Area 01/02/2023

Column - 9b-11b / Eb

| | | |
|---|---|---|
| +55<br>+57<br>+55<br>+54<br>+56<br>+54 | Semi direct<br>Cover = 55-60 mm | +63 +67 +60 +72<br>+71 +71 +64 +61<br>+86 +78 +82 +84<br>+95 +83 +77 +81<br>+118 +94 +86 +91<br>+95 +105 +108 +db |

(Indirect)

Beam - 8b-9b / Db-Cb (Direct)

+62 +59 +63 +85 +72

PL = 240 mm

Beam - 14b-9b / 4b-3b (Direct) PL: 240

+59 +75 +63 +65 +62

Beam - 4b / Kb-Jb (Direct)

+60 +64 +60 +61 +

PL - 240

The Measurements on this page were taken on 01/02



Tower B 3rd Floor Common Area 01/02/2023

Slab → RHT - Fb-Gb / 9b-10b

| | | |
|---|---|---|
| 32 | 30 | 32 |
| 32 | 30 | 32 |
| 32 | 32 | 32 |

Slab → RHT 4b-7b / Ob-Cb

| | | |
|---|---|---|
| 32 | 32 | 32 |
| 32 | 32 | 34 |
| 32 | 38 | 32 |

The Measurements on this page were taken on 01/02

01/02/2023

Tower B 2nd Floor

Flat no - 0204

Beam -> 10-11b / Kb

+69 +72 +71 +69 +68 +73 PL = 260

Flat no 0204

Column -> Kb / 11b

| | | | | |
|---|---|---|---|---|
| +92 | +94 | +98 | +82 | +78 |
| +65 | +103 | +103 | +95 | +83 |
| +79 | +82 | +104 | +76 | +76 |
| +74 | +87 | +98 | +85 | +69 |
| +74 | +71 | +90 | +87 | +74 |
| +62 | +86 | +81 | +84 | +76 |

Indirect

Slab — Kb / Lh - 10b / 11b

| | | |
|---|---|---|
| 34 | 32 | 38 |
| 36 | 34 | 32 |
| 32 | 34 | 34 |

RHT

The Measurements on this page were taken on 01/02

22

Tower B 2nd Floor

Flat no 0204

Column - 10b - Kb

PL : 300

| | | | | |
|---|---|---|---|---|
| +81 | +83 | +77 | +77 | |
| +88 | +88 | +76 | +74 | |
| +72 | +98 | +84 | +91 | |
| +85 | +85 | +74 | +63 | |
| +63 | +69 | +65 | +73 | |
| +89 | +84 | +78 | +82 | |

Indirect

Column - 11b - Mb

PL : 300

| | |
|---|---|
| +75 | +91 |
| +67 | +82 |
| +75 | +84 |
| +66 | +88 |
| +74 | +78 |
| +62 | +65 |

Indirect

Slab - 11b - 12b / 2b - Mb

| | | |
|---|---|---|
| 38 | 38 | 38 |
| 38 | 38 | 32 |
| 40 | 32 | 32 |

The Measurements on this page were taken on 01/02

23

Tower B. 2nd Floor. 01/02/2023

~~Slab~~ →

Flat NO - (0203)

Beam - Kb/2b-3b (Direct)

| | | | | | |
|---|---|---|---|---|---|
| +79 | +81 | +80 | +81 | +91 | +90 |

PL = 270 mm

Slab - 2b-3b/2b-Kb (RHT)

| | | |
|---|---|---|
| 32 | 38 | 38 |
| 32 | 38 | 38 |
| 32 | 36 | 38 |

(0203)

Column → 2b - Mb

| | |
|---|---|
| +88 | +86 |
| +85 | +85 |
| +77 | +79 |
| +80 | +91 |
| +104 | +104 |
| +96 | +116 |

Indirect

Slab - 1b-2b/2b-Mb

| | | |
|---|---|---|
| 32 | 32 | 32 |
| 36 | 32 | 38 |
| 32 | 34 | 32 |

RHT

The measurements on this page were taken on 01/02

24

Tower B 2nd Floor. 01/02/2023

Flat (0203)

Column - 3b/Kb

| | | |
|---|---|---|
| +84 | +68 | +67 |
| +73 | +72 | +59 |
| +72 | +73 | +63 |
| +63 | +59 | +60 |
| +78 | +76 | +72 |

Indirect

Slab - RHT - Kb-2b/3b-4b

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 32 | 32 | 30 |
| 32 | 32 | 34 |

RHT

The measurements on this page were taken on 01/02

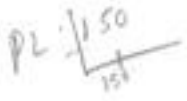
25

01/02/2023

ower B 14th Floor. (Common Area)

olumn → UPVT → 9b-11b / Eb-Fb

+60
+63
+95
+62
+58
+66
} Semidirect




+69 +66 +68 +67 +68
+71 +63 +65 +61 +69
+98 +97 +76 +72 +85
+70 +90 +78 +72 +72
+81 +79 +73 +80 +87
+88 +89 +79 +82 +86
} Indirect

umn → UPVT → 9b-11b / Gb-Hb

+66
+62
+53
+57
+55
+80
} Semidirect

+98 +78 +75 +74
+70 +75 +72 +73
+75 +80 +81 +87
+85 +70 +71 +70
+71 +79 +78 +84
+80 +90 +71 +76

The Measurements on this page were taken on ...a/02...



01/02/2023

Tower B 14th Floor Common Area

Beam → 8b-9b - Cb-Db

+63 +65 +68 +66 +75

PL = 240mm

Beam → Hb-Gb / Gb-3b

+65 +63 +61 +60 +62

PL = 230mm

Slab → Hb-Gb / Fb-Eb / 3b-4b

| | | |
|---|---|---|
| 36 | 34 | 40 |
| 36 | 44 | 40 |
| 38 | 38 | 42 |

RHT

Beam → 8b-9b / Kb-Jb

+64 +87 +69 +64 +78

PL = 240mm

The Measurements on this page were taken on ...a/02...

01/02/2023

Tower B 4th Floor Common Area.

Slab → 8b-9b / 10b - 9b-Fb

| | | |
|---|---|---|
| 38 | 38 | 40 |
| 38 | 36 | 40 |
| 38 | 38 | 38 |

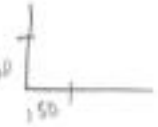
RHT

Tower B 5th Floor Common Area

Column → 9b-11b / Fb-Ib

Semidirect

+56
+52
+56
+56
+50
+65




Indirect

| | | | |
|---|---|---|---|
| +99 | +81 | +87 | +74 |
| +76 | +75 | +76 | +78 |
| +89 | +87 | +80 | +97 |
| +91 | +84 | +96 | +86 |
| +85 | +92 | +103 | +142 |
| +118 | +128 | +117 | +164 |



01/02/2023

Tower B 5th Floor common Area

Column → 9b-11b / Fb-Ib

Semidirect

+42
+43
+47
+34
+42
+82

Indirect

+74 +86 +72 +70 +
+69 +69 +68 +72 +
+74 +81 +76 +77 +
+75 +74 +73 +71
+92 +129 +163 +142
+147 +78 +61 +125

Beam → 8b-9b / Cb-Db

Direct

+59 +62 +65 +78

P2 = 230mm.

Beam → 4b / 6b-Cb

Direct

+56 +54 +57 +58

P2 = 230mm

Slab → 3b-4b / Cb-Eb

| | | |
|---|---|---|
| 34 | 38 | 38 |
| 40 | 38 | 38 |
| 38 | 40 | 34 |

RHT

01/02/2023

Tower B 5th Floor Common Area

m Hb-Gb / 3b-4b

Direct

+64 +59 +58 +61 +72

PL= 240

n → Gb-Fb / 3b-4b

| | | |
|---|---|---|
| 38 | 34 | 38 |
| 34 | 36 | 36 |
| 38 | 36 | 32 |

R+T

ib → 4b-7b / Kb-Jb

| | | |
|---|---|---|
| 38 | 40 | 36 |
| 38 | 38 | 40 |
| 36 | 38 | 36 |

R+T

The Measurements on this page were taken on 01/02



01/02/2023

Tower B 5th Floor Common Area

Beam — 8b-9b / Kb-Jb

+60 +60 +63 +73 +74

PL = 240mm

The Measurements on this page were taken on 01/02

02/02/2023

owner B 4th Floor.

Flat No - 403

Beam -> Cb/10b-11b

| | | | | |
|---|---|---|---|---|
| +92 | +90 | +92 | +106 | +96 |

PL = 300mm

Slab -> RHT -> 10b/11b / Cb/Bb

| | | |
|---|---|---|
| 42 | 40 | 42 |
| 42 | 40 | 42 |
| 42 | 40 | 42 |

RHT

Column -> UPVT - 11b/Ab

Indirect PL: 300

| | |
|---|---|
| +87 | +88 |
| +85 | +85 |
| +85 | +84 |
| +82 | +89 |
| +86 | +73 |
| +83 | +82 |

The Measurements on this page were taken on 2/2

(32)

02/02/2023

Column -> UPVT -> Cb/11b

PL 300 Indirect

| | | | |
|---|---|---|---|
| +89 | +91 | +98 | +94 |
| +91 | +92 | +88 | +88 |
| +87 | +99 | +98 | +86 |
| +81 | +89 | +85 | +86 |
| +89 | +84 | +79 | +79 |

Slab -> Ab-Bb/12b-11b

| | | |
|---|---|---|
| 40 | 42 | 42 |
| 38 | 40 | 42 |
| 40 | 40 | 42. |

The Measurements on this page were taken on 2/2

(33)

02/02/2023

Tower B Ltd Floor.

Lab - (402)

Beam → Kb / 10b - 11b

+70 +70 +73 +80 +75 PL = 260 mm

Slab → Kb - 2b / 10b - 11b

| | | |
|---|---|---|
| 38 | 38 | 38 |
| 42 | 36 | 42 |
| 38 | 32 | 34 |

Lemy Beam → 11b - Mb UDVT - (Indirect)

PL 300

| | | |
|---|---|---|
| +72 | +73 | +87 |
| +73 | +86 | +72 |
| +86 | +74 | +74 |
| +84 | +72 | +66 |
| +74 | +66 | +74 |

The Measurements on this page were taken on 2/2

34

02/02/2023

Column → Kb / 11b

PL = 300 Indirect

| | | | | |
|---|---|---|---|---|
| +64 | +66 | +73 | +81 | +87 |
| +85 | +81 | +68 | +65 | +60 |
| +74 | +87 | +68 | +86 | +89 |
| +81 | +72 | +71 | +65 | +64 |
| +74 | +68 | +69 | +74 | +84 |

Slab → 2b - Kb / 11b - 12b.

| | | |
|---|---|---|
| 48 | 44 | 42 |
| 48 | 50 | 48 |
| 50 | 48 | 48 |

The Measurements on this page were taken on 2/2

35

02/02/2023

Tower B - 5th Floor.

Flat → 503

Beam → Kb/2b-3b  PL = 270 mm

+79 +81 +82 +84 +80 +78

slab → RHT → 2b-3b / 2b-Kb.

| | | |
|---|---|---|
| 40 | 38 | 38 |
| 40 | 40 | 34 |
| 38 | 36 | 38 |

Column → UPOT - 2b/Mb (Indirect)

PL: 300

| | |
|---|---|
| +90 | +87 |
| +82 | +89 |
| +95 | +85 |
| +79 | +80 |
| +83 | +78 |
| +79 | +84 |

The Measurements on this page were taken on ..... 2/2/23



02/02/2023

Column → 2b/2b (semidirect)

| |
|---|
| +62 |
| +61 |
| +58 |
| +56 |
| +52 |
| +60 |
| +65 |

slab → 2b-3b / 2b-Mb

| | | |
|---|---|---|
| 42 | 42 | 44 |
| 44 | 40 | 46 |
| 46 | 42 | 42 |

RHT

slab → 2b-Kb / 1b-2b

| | | |
|---|---|---|
| 36 | 34 | 36 |
| 34 | 34 | 36 |
| 32 | 40 | 38 |

RHT

The Measurements on this page were taken on ..... 2/2/23

Tower B 5th Floor 02/02/2023

Slat - (504)

Beam - Wb / 10b - 11b (Direct)

| | | | | | |
|---|---|---|---|---|---|
| +82 | +85 | +85 | +81 | +84 | +76 |

PL = 280 mm

Slab - RHT → 5b - Wb / 10b - 11b

| | | |
|---|---|---|
| 30 | 32 | 32 |
| 34 | 34 | 32 |
| 34 | 32 | 34 |

Column - UPVT - Nb/11b (Indirect)

PL : 300

| | |
|---|---|
| +84 | +81 |
| +72 | +76 |
| +85 | +76 |
| +78 | +92 |
| +67 | +84 |
| +66 | +70 |

The Measurements on this page were taken on 2/2



02/02/2023

Column - UPVT - 11b / 12b (Indirect)

SW

PL : 300

| | | | | |
|---|---|---|---|---|
| +66 | +69 | +65 | +71 | +70 |
| +70 | +60 | +63 | +67 | +65 |
| +69 | +65 | +74 | +69 | +68 |
| +64 | +67 | +63 | +75 | +63 |
| +68 | +69 | +66 | +70 | +77 |
| +72 | +67 | +67 | +76 | +74 |

Slab - RHT - 2b - Wb / 11b - 12b

| | | |
|---|---|---|
| 38 | 36 | 34 |
| 40 | 38 | 38 |
| 36 | 34 | 32 |

RHT

The Measurements on this page were taken on 2/2

Tower (B) 5th Floor 02/02/2023

Flat No - 501

Beam - UPUT - Cb / 10b - 11b (Direct)

+94 +91 +92 +96 +91 PL = 280 mm

Slab - RHT - 10b - 11b / Cb - Bb

| | | |
|---|---|---|
| 36 | 34 | 36 |
| 32 | 32 | 34 |
| 34 | 36 | 32 |

Column - UPUT - 11b / Ab (Indirect)

PL: 300

| | |
|---|---|
| +79 | +79 |
| +78 | +78 |
| +77 | +78 |
| +67 | +64 |
| +77 | +63 |
| +64 | +81 |
| +70 | +71 |

The Measurements on this page were taken on 2/2 (40)

02/02/2023

Column - UPUT - Bb / 10b (Indirect)

PL: 250

| | | |
|---|---|---|
| +79 | +79 | +80 |
| +80 | +73 | +71 |
| +88 | +74 | +67 |
| +76 | +68 | +69 |
| +69 | +60 | +79 |

Slab - RHT - Bb - Ab / 9b - 10b

| | | |
|---|---|---|
| 40 | 38 | 42 |
| 40 | 38 | 40 |
| 42 | 40 | 42 |

RHT

Slab - RHT - Bb - Cb / 11b / 12b

| | | |
|---|---|---|
| 42 | 40 | 40 |
| 40 | 42 | 40 |
| 42 | 40 | 42 |

The Measurements on this page were taken on 2/2 (41)

02/02/2023

Tower B 6th Floor

Flat No - 602

Beam - Cb/3b-2b (Direct)

| | | | | |
|---|---|---|---|---|
| +65 | +66 | +67 | +69 | +68 |

PL = 260mm

2b -> 2b/Bb / Bb - Cb

| | | |
|---|---|---|
| 38 | 38 | 36 |
| 42 | 38 | 40 |
| 36 | 40 | 38 |

RHT

olumn -> 2b/Ab PL 300

| | |
|---|---|
| +81 | +83 |
| +80 | +78 |
| +74 | +73 |
| +81 | +91 |
| +75 | +93 |
| +98 | +98 |

The Measurements on this page were taken on ..... 1/2 (42)

02/03/2023

Column - 2b/Cb (Indirect)

PL: 300

| | | | |
|---|---|---|---|
| +74 | +99 | +106 | +82 |
| +79 | +94 | +93 | +87 |
| +69 | +83 | +98 | +83 |
| +72 | +91 | +69 | +70 |
| +68 | +75 | +74 | +95 |
| +95 | +75 | +68 | +70 |

Slab - Bb - Cb / 1b - 2b

| | | |
|---|---|---|
| 42 | 40 | 42 |
| 42 | 40 | 42 |
| 44 | 42 | 40 |

RHT

Slab - 3b - 4b / Ab - Bb

| | | |
|---|---|---|
| 42 | 42 | 44 |
| 40 | 40 | 42 |
| 40 | 44 | 42 |

RHT

The Measurements on this page were taken on ..... 2/2 (43)

02/02/2023

ower B 7th Floor (7th Floor)

lat NO - 703

beam -> Kb/2b-3b (Direct)

+88 +98 +96 +93 +99 +89

PL = 280 mm

Slab -> 2b-3b / Kb-Lb

| | | |
|---|---|---|
| 38 | 36 | 38 |
| 36 | 36 | 38 |
| 38 | 36 | 28 |

olumn -> 2b / Mb (Indirect)

| |
|---|
| +71 +80 |
| +71 +80 |
| +77 +72 |
| +72 +79 |
| +75 +68 |

column -> 3b / Kb (Indirect)

| |
|---|
| +66 +72 +80 +76 +79 |
| +82 +78 +76 +75 +67 |
| +65 +71 +85 +76 +88 |
| +84 +74 +71 +74 +65 |
| +66 +76 +66 +79 +86 |

The Measurements on this page were taken on .....

(44)

02/02/2023

Slab -> 2b-Mb / Lb-3b

| | | |
|---|---|---|
| 40 | 38 | 38 |
| 38 | 40 | 36 |
| 38 | 40 | 40 |

Flat NO 704

Beam -> UPVT -> Kb / 10b-11b (Direct)

+91 +83 +89 +96 +97 +89

PL = 280 mm

Columnn -> 11b / Mb (Indirect) Column Kb/10b (Indirect)

| |
|---|
| +83 +82 + |
| +82 +82 |
| +88 +79 |
| +82 +89 |
| +80 +83 |

| |
|---|
| +90 +82 |
| +92 +98 |
| +94 +85 |
| +90 +93 |
| +91 +90 |

The Measurements on this page were taken on .....

(45)

02/04/2023

Slab - RHT - 9b-10b / Lb-Mb

| | | |
|---|---|---|
| 30 | 30 | 28 |
| 28 | 30 | 32 |
| 26 | 28 | 30 |

Slab - RHT - 10b-Mb / Kb-Lb

| | | |
|---|---|---|
| 30 | 32 | 28 |
| 28 | 28 | 30 |
| 28 | 30 | 28 |

6th Floor. Tower B

lat No - 601

eam - Cb / 10b-11b (Direct)

PL: 28°

+86 +96 +87 +111 +98

The Measurements on this page were taken on 2/2



Tower B 6th Floor Flat 601

Slab → 12b-11b / Bb-Cb

| | | |
|---|---|---|
| 42 | 40 | 40 |
| 40 | 42 | 40 |
| 44 | 42 | 40 |

RHT

Column → 11b / Ab (Indirect)

+93 +88 +84 +80

+84 +80

+79 +89

+86 +84

+89 +80

Slab → 5b-8b / Ab-Bb

| | | |
|---|---|---|
| 48 | 50 | 50 |
| 42 | 42 | 48 |
| 48 | 44 | 48 |

RHT

The Measurements on this page were taken on 2/2

02/02/2023

# Tower B 6th Floor Common Area

Column → 9b-11b / Eb-Hb

PL: 300

| | | | | |
|---|---|---|---|---|
| +84 | +70 | +63 | +78 | +64 |
| +59 | +61 | +66 | +66 | +66 |
| +88 | +64 | +68 | +66 | +65 |
| +74 | +78 | +78 | +74 | +117 |
| +105 | +87 | +78 | +71 | +81 |
| +110 | +110 | +75 | +87 | +87 |

Beam → 8b-9b / Db-Cb (Direct)

+62 +64 +62 +74

PL = 230 mm

Beam → 4b/Jb-Kb (Direct)

+54 +56 +57 +58 +58

P2 = 220 mm

The Measurements on this page were taken on 02/02



02/02/2023

# Tower B 6th Floor Common Area

Slab → RHT → 3b-4b / Kb-Jb

| | | |
|---|---|---|
| 32 | 32 | 32 |
| 30 | 34 | 34 |
| 32 | 34 | 36 |

Slab → RHT → 4b-3b / Fb-Gb

| | | |
|---|---|---|
| 44 | 38 | 36 |
| 34 | 34 | 32 |
| 38 | 34 | 35 |

Slab → 4b-8b / Fb-Gb

Beam → UPVT - 4b / Db-Cb (Direct)

+58 +58 +57 +56 +63

P2 = 230 mm

The measurements on this page were taken on 02/2

02/02/2023

Tower B 7th Floor Common Area

Column → OPUT → Eb-Fb / 10b-11b (Indirect)

Shear wall

PL : 300

| | | | | |
|---|---|---|---|---|
| +78 | +88 | +76 | +80 | +77 |
| +76 | +73 | +72 | +72 | +73 |
| +79 | +73 | +85 | +80 | +97 |
| +92 | +69 | +70 | +64 | +73 |
| +76 | +70 | +98 | +69 | +85 |

Column → OPUT — 9b-10b / Eb-Fb (Semi direct)

| |
|---|
| +96 |
| +106 |
| +102 |
| +109 |
| +97 |
| +95 |
| +104 |
| +112 |

Semi direct

The Measurements on this page were taken on 02/2



Beam → OPUT - 8b-9b / Jb-Kb (Direct)

+63 +63 +67 +64 +64 PL = 230 mm

Beam → OPUT - 4b / Jb-Kb (Direct)

+63 +64 +63 +67 +68 PL = 230

Slab → RHT - 4b-7b / Jb-Kb

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 32 | 32 | 34 |
| 32 | 32 | 34 |

RHT

Slab → RHT Cb-Db / 9b-10b

| | | |
|---|---|---|
| 34 | 38 | 40 |
| 38 | 40 | 40 |
| 42 | 38 | 38 |

The Measurements on this page were taken on 02/2

02/02/2023

8th Floor - Common Area.

Beam → UDVT → Eb - Fb / 9b - Ub

pt 300

| | | | | |
|---|---|---|---|---|
| +84 | +89 | +88 | +89 | +112 |
| +87 | +80 | +79 | +75 | +85 |
| +80 | +91 | +110 | +79 | +96 |
| +95 | +81 | +98 | +80 | +87 |
| +118 | +97 | +100 | +104 | +114 |

The Measurements on this page were taken on 07/2/23

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03/02/2023

Tower B - ~~8th Floor~~ 8th Floor

~~Flat No - 8007~~ Common Area

Column → 9b - Hb - 11b - 9b (Indirect)

| | | | |
|---|---|---|---|
| +104 | +97 | +99 | +98 |
| +98 | +113 | +108 | +109 |
| +97 | +96 | +99 | +112 |

| |
|---|
| +66 |
| +62 |
| +62 |
| +55 |
| +59 |

Semidirect

150 / 150

Column → Eb - Fb / 9b - 11b

| |
|---|
| +68 |
| +67 |
| +64 |
| +66 |
| +59 |

Semidirect

150 / 150

The Measurements on this page were taken on 8/2

53

eam → Hb-Gb-Fb-Eb / 9b-10b

Semi direct

+44 +40 +49 +61 +60

150 | 150

eam → 8b-9b / Jb-Kb (Direct

67 + 65 +68 +66 +67 PL = 260 mm

Slab → 5b- 7b / J6-Kb (RHT)

| | | |
|---|---|---|
| 44 | 42 | 44 |
| 42 | 42 | 42 |
| 40 | 40 | 42 |

RHT

Cover - 38-46

Beam — Cb-db / 4b (Direct)

+60 +61 +62 +66+63 PL = 240 mm

The Measurements on this page were taken on 4/2.



03/02/2023

Tower B 6th Floor.

Flat NO - 603

slab → Kb - Jb / 2b - 3b

Cover = 31-39 mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 34 | 32 | 32 |
| 34 | 36 | 36 |

RHT

Column → Nb | 2b (Indirect)

+80 +80
+77 +77
+73 +73
+74 +70
+71 +77
+69 +63

Covn = 40 - 46 mm

Column → 3b | Kb (Indirect)

SW

+91 +93 +94 +88
+94 +92 +95 +105
+95 +89 +89 +90
+91 +84 +95 +88
+86 +82 +83 +78
+75 +87 +92 +90

The Measurements on this page were taken on 2/2.

03/02/2023
SL

Slab → RHT 3b-4b / 2b-Mb

| | | |
|---|---|---|
| 34 | 36 | 32 |
| 36 | 34 | 36 |
| 38 | 38 | 36 |

RHT

Slab - 36
Beam - 86

Tower B  4th Floor

Flat No - 401

Beam → CB | 10b-11b → (Indirect)

Respod - 46 (Beam)
36 (Slab)

+78 +82 +82 + 80 + 88

R = 270 mm

Column → cb / ub (Semidirect)

+64
+71
+66
+65
+

Semidirect

Cover = 22-45mm

The Measurements on this page were taken on 3/2

56

03/02/2023

Slab → RHT → 10b-11b | Cb-Eb

| | | |
|---|---|---|
| 36 | 34 | 38 |
| 34 | 34 | 38 |
| 36 | 32 | 34 |

RHT

Respod →
Slab - 36

Column → ub / Ab (Indirect)

| | |
|---|---|
| +91 | +94 |
| +79 | +76 |
| +75 | +70 |
| at | |

| | |
|---|---|
| +82 | +74 |
| +71 | +73 |
| +98 | +72 |

Slab → 11b - 12b | Bb - Cb → RHT

| | | |
|---|---|---|
| 30 | 36 | 34 |
| 36 | 32 | 32 |
| 36 | 34 | 32 |

RHT

Cover - 28-38mm

The Measurements on this page were taken on 3/2

57

Tower B 6th Floor.

Flat - (604)

The Measurements on this page were taken on ...../12/.....



Tower (B) 7th Floor

03/02/2023

Flat (702)

Beam → Cb/3b-2b (Indirect)

+58 +56 +59 +69 +74

PL = 23 mm

Cover → 36 - 48 mm

Resprod → 36

Slab → Bb/Cb - 1b/2b (RHT)

| | | |
|---|---|---|
| 38 | 36 | 38 |
| 34 | 38 | 36 |
| 34 | 38 | 35 |

RHT

Resprod - 29

Cover → 45 - 58 mm

Column → Cb/2b (Semidirect)

| |
|---|
| +41 |
| +40 |
| +42 |
| +45 |

Semidirect

Cover → 73 - 83 mm

The Measurements on this page were taken on ...../12/.....

Tower B 7th Floor 03/02/2023

Column -> 2b/Ab (Indirect)

| | |
|---|---|
| +81 | +79 |
| +88 | +94 |
| +101 | +70 |

Cover - 40 - 63 mm

Slab -> 4b/5b - Bb/Ab - RHT

| | | |
|---|---|---|
| 34 | 38 | 38 |
| 34 | 34 | 36 |
| 38 | 32 | 36 |

RHT

The Measurements on this page were taken on 2/2

60

03/02/2023

Tower (B) 6th Floor

Flat 604 (604)

Column -> 10b/Kb

Cover -> 80 - 110 mm

Slab -> 2b/Kb/12b/11b

Cover -> 35 - 48 mm

Resipod = 38

| | | |
|---|---|---|
| 34 | 38 | 36 |
| 32 | 34 | 32 |
| 36 | 36 | 32 |

Column -> 11b/Mb (Indirect)

| | |
|---|---|
| +87 | +85 |
| +83 | +73 |
| +80 | +89 |
| +91 | +82 |

Cover - 36 - 53mm

The Measurements on this page were taken on 2/2

61

Tower B 6th Floor 03/02/2023

Column → UPVT - Kb | 10b (Indirect)

| | |
|---|---|
| +89 | +78 |
| +60 | +82 |
| +80 | +84 |

Slab → 9b - 10b / Lb - Mb

| | | |
|---|---|---|
| 38 | 34 | 36 |
| 38 | 32 | 34 |
| 34 | 38 | 32 |

Resipod - 40 (Slab)
Cover - 34 - 40mm

Beam → 10b - 11b / Kb

+87 +86 +83 +87 +98 PL = 280mm

The Measurements on this page were taken on .....

(62)

Tower B 8th Floor 03/02/2023

Flat NO - (801)

Beam → Cb | 10b - 11b

Cover → 42 - 60mm → Beam
36 - 46mm → Slab (10b - 11b | Cb - Eb)

Beam → Cb | 10b - 11b

+56 +57 +58 +61 +61 PL = 240mm

Slab → 10b - 11b / Cb - Eb → RHT

| | | |
|---|---|---|
| 38 | 38 | 40 |
| 40 | 40 | 42 |
| 38 | 38 | 42 |

RHT

Slab → Bb - Cb / 11b - 12b

| | | |
|---|---|---|
| 38 | 40 | 38 |
| 33. | 34. | 38. |
| 36 | 42 | 40 |

RHT

Resipod → 39

(Beam - 11b - 12b / Bb - Resipod Leg)

The Measurements on this page were taken on .....

(65)

Tower B 8th Floor. 03/02/2023

Column → 11b/Ab (Indirect)

| | |
|---|---|
| +81 | +82 |
| +84 | +84 |
| +83 | +92 |
| +83 | +81 |

Cover - 58-64 mm

Column → 11b/Cb (Semi direct) ডানে

| |
|---|
| +98 |
| +98 |
| +97 |
| +108 |

Cover - 47-58 mm

Column → 12b/Cb (Indirect)

| | |
|---|---|
| +89 | +90 |
| +95 | +96 |
| +94 | +93 |
| +87 | +92 |
| +89 | +90 |

Slab - Eb-10b / Ab-Bb

| | | |
|---|---|---|
| 36 | 32 | 34 |
| 36 | 32 | 32 |
| 34 | 36 | 36 |

The Measurements on this page were taken on 9/2



Tower B 8th Floor. 03/02/2023

Flat - 803

Beam - Kb/3b-2b (Direct)

| | | | |
|---|---|---|---|
| +63 | +63 | +68 | +69 |

PL = 230 mm

Slab → Kb-Hb / 1b-2b

| | | |
|---|---|---|
| 36 | 34 | 38 |
| 36 | 34 | 38 |
| 36 | 34 | 38 |

Cover - 36-47 mm

Respod - 23

Beam → 2b / Kb-Hb

Respod - 38

Slab → 5b-3b / 2b-Hb

(Cover - 38-56 mm)

Rest

| | | |
|---|---|---|
| 34 | 32 | 32 |
| 32 | 34 | 32 |
| 34 | 32 | 32 |

Respod = 34

The Measurements on this page were taken on 8/2

Beam → 2b / 5b-3b

Cover - 56-63 mm

Respod - 26

Tower B 8th Floor 03/02/2023

Column → 2b / Kb (Indirect)

| |
|---|
| +98 +95 |
| +94 +85 |
| +86 +78 |

Cover - 57 - 68 mm

Tower B 9th Floor

~~Slab~~ No - Common Area

Beam - Fb - Gb / 9b - 10b

Semidirect

55 + 67 + 64 + 88 + 58 +

150 / 150

Column - 9b - 11b / Eb (Semidirect)

| |
|---|
| +76 |
| +72 |
| +66 |
| +75 |

150 / 150

Cover = 24 - 28 mm

The Measurements on this page were taken on .....

68

Tower B 9th Floor - Common Area 03/02/2023

Slab - 9b - 10b / Jb - Kb (Indirect)

UPVT

| |
|---|
| +85 + 88 |
| +89 + 79 |
| +99 + 89 |

| | | |
|---|---|---|
| 38 | 36 | 34 |
| 36 | 36 | 34 |
| 34 | 38 | 36 |

Cover - 36 - 48 mm

Slab
3b/4b - 11b-9b/Fb-Eb

| |
|---|
| +70 +68 |
| +68 +70 |

PL = 300

Column
Eb-Fb/9b-4b

| |
|---|
| +74 |
| +76 |

PL = 300 mm

old
+88 +82
+100 +92
+106 +92
with block

Beam → 8b-9b / Jb-Kb (Direct)

+73 +70 +71 +66

PL = 250 mm

Column - UPV - 11b-9b / Eb-Fb (Indirect)

| |
|---|
| +109 +107 +107 +103 |
| +115 +125 +118 +112 |
| +86 +134 +102 +99 |

Cover - 24 - 32 mm

Beam - UPVT - 4b / Db-Cb (Direct)

+66 +65 +75 +~~87~~ +~~85~~

PL = 260 mm

The Measurements on this page were taken on .....

67

03/02/2023

Tower B 9th Floor

Flat - 901

Beam - UPVT - Cb/10b-11b

(Resipod - 50)

+99 +74 +80 +83 +81

P2 = 260mm  Cover - 27-49mm

Resipod

Column - Cb/10b

Cover = 54-70mm

Slab - 10b-11b / Cb-Eb → RHT

| | | |
|---|---|---|
| 34 | 36 | 36 |
| 36 | 32 | 34 |
| 38 | 36 | 34 |

RHT

Cover - 26-35mm

Column - 11b/Ab

| | |
|---|---|
| +81 | +81 |
| +96 | +92 |
| +89 | +74 |

Cover - 30-36mm

The Measurements on this page were taken on 3/2



Tower B 9th Floor

03/02/2023

Slab - 8b-10b / Ab-Bb

| | | |
|---|---|---|
| 42 | 42 | 38 |
| 40 | 40 | 42 |
| 40 | 42 | 42 |

Resipod - 58

Cover - 35-44mm

Beam - Bb - 8b/10b

Resipod - 24

Flat - 903

(Kb - 2b) - Cover - 64-76mm

(2b/1b) - Cover - 58-63mm

Beam - 2b-3b/Kb - UPVT - (Direct)

| |
|---|
| +105 |
| +104 |
| +108 |
| +104 |
| +100 |

The Measurements on this page were taken on 3/2

03/02/2023

Tower B - 9th Floor

slab — 1b-2b/Mb-Lb

| | | |
|---|---|---|
| 34 | 34 | 32 |
| 32 | 32 | 34 |
| 32 | 30 | 32 |

Cover - 43-50mm

Column → 2b/Mb (Indirect)

| | | |
|---|---|---|
| +95 | +101 | +123 |
| +93 | +95 | +104 |
| +95 | +96 | +90 |

Cover - 68-56 mm

Column → 3b/Kb (Indirect)

| | | |
|---|---|---|
| +117 | +122 | +121 |
| +124 | +120 | +105 |
| +116 | +128 | +118 |

Cover - 56-59

The Measurements on this page were taken on .....



03/02/2023

Tower B -

slab — 5b-3b/2b-Mb

| | | |
|---|---|---|
| 36 | 34 | 36 |
| 32 | 34 | 36 |
| 34 | 32 | 32 |

RHT

Tower B 10th Floor Common Area

Column → 10b-Gb/9b-11b (Semidirect)

| | | |
|---|---|---|
| +61 | | +103 +97 +97 +113 |
| +62 | | +136 +138 +114 +126 |
| +61 | Semi direct | +153 +133 +124 + 9b |
| +60 | | Indirect |
| +154 (db) | 150 | |
| +152 (db) | 150 | |

Beam → Fb-Eb (Gb-10b)/9b-10b

+52 + 53 +56 + 55 +47 +54 (Semidirect)

The Measurements on this page were taken on .....

150

150

Tower B 10th Floor 03/02/2023

Column → 9b-11b / Fb-Eb

| |
|---|
| +71 |
| +66 |
| +66 |
| +69 |
| +97 |

Semi direct

150 × 150

Cover = 46 - 51 mm

slab → 9b-10b / Fb-Gb (RHT)

| | | |
|---|---|---|
| 32 | 32 | 34 |
| 34 | 30 | 36 |
| 38 | 38 | 36 |

RHT

Cover = 46 - 50 mm

Beam → Eb-9b / Kb-Jb

+60 +61 +60 +62 +66 P2

The Measurements on this page were taken on 2/2

(74)

Tower B 10th Floor 03/02/2023

Slab → UDUT - 9b-10b / Jb-Kb (Indirect)

| | |
|---|---|
| +65 | +71 |
| +69 | +63 |
| +83 | +67 |

Cover = 38 - 42 mm

Beam → UDUT - 4b/Db-Cb (Direct)

+63 +64 +64 +65 P2 = 240 mm

11th Floor Common Area. Tower B.

Column → Hb-Gb / 9b-11b. (Semi direct)

| |
|---|
| +55 |
| +62 |
| +54 |
| +62 |

Semi direct 150 × 150

Cover = 46-52 mm

Column → Fb-Eb / 9b-11b

| |
|---|
| +54 |
| +57 |
| +55 |
| +57 |
| +61 |

semi direct

Cover = 44 - 50 mm

The Measurements on this page were taken on 2/2

(75)

Tower B 10th Floor Common Area 03/02/2023

Beam → 9b-10b / Fb-Gb (Semi direct)

Semi direct

+46 +49 +52 +59 +53 +51

150 | 4

Column → Hb-Gb / 9b-11b (Indirect)

PL=300 mm

| | | | |
|---|---|---|---|
| +96 | +91 | +96 | +88 |
| +103 | +100 | +100 | +100 |
| +100 | +106 | +111 | +110 |

Cover = 70-73 mm

| | |
|---|---|
| +125 | +80 |
| +112 | +70 |

with plaster +15 | PL=300

Beam → 8b-9b / Jb-Kb (Direct)

+69 +59 +59 +62 +63 PL = 230 mm

Beam → 4b / Kb-Jb (Direct)

+59 +60 +62 +61 +64 +61 PL = 230 mm

The Measurements on this page were taken on 3/2

74

Tower B 11th Floor 03/02/2023

Slab → 4b-7b / Kb-Jb (RHT)

| | | |
|---|---|---|
| 32 | 36 | 32 |
| 32 | 32 | 30 |
| 30 | 30 | 30 |

RHT

Cover = 31-46 mm

Slab → UPVT → 9b-10b / Jb-Kb (Indirect)

| | |
|---|---|
| +62 | +66 |
| +73 | +67 |
| +71 | +87 |

Cover = 28-44 mm

Beam → UPVT → 4b / Db-Cb (Direct)

+68 +63 +64 +63 +67 PL = 250 mm

Cover = 37-49 mm

The Measurements on this page were taken on 3/2

75

04/02/2023

Tower (B) 10th Floor

Flat No - (1004)

Beam → Kb / 11b - 10b

+82 +78 +85 +83 +79

PL: 260mm

lumn - 10b / Kb Covermeta.

Cover = 66 - 72mm

lab → Kb - 2b / 11b - 12b (RHT)

| | | |
|---|---|---|
| 42 | 40 | 40 |
| 46 | 42 | 48 |
| 44 | 46 | 46 |

RHT

Cover = 42 - 48mm

olumn - 10b / Kb (UDVT) Indirect)

| | |
|---|---|
| +77 | +82 |
| +77 | +81 |
| +80 | +81 |

The Measurements on this page were taken on ...4/2...

78

04/02/2023

Slab → Kb - 2b / 11b - 12b

| | | |
|---|---|---|
| 36 | 36 | 38 |
| 38 | 40 | 36 |
| 38 | 32 | 34 |

RHT

Cover - 38 - 44

Beam - 11b - 12b / 2b — Cover = 38 - 46mm

Beam - Hb - Kb / 11b - UDVT

+77 +79 +81 +78 +78

PL = 270mm

Flat No (1001)

Beam → 10b - 11b / cb (Direct)

+75 +83 +82 +88 +93

Cover = 48 - 55mm

PL = 290mm

Slab → Bb - Cb / 10b - 11b

Cover -

| | | |
|---|---|---|
| 36 | 34 | 36 |
| 38 | 36 | 36 |
| 36 | 38 | 36 |

RHT

Cover = 36 - 44mm

The Measurements on this page were taken on ...4/2...

77

04/02/2022

Slab -> Bb - Cb / 11b - 12b

| | | |
|---|---|---|
| 36 | 38 | 36 |
| 36 | 34 | 32 |
| 34 | 38 | 36 |

Cover = 34 - 42 mm

Column -> 11b / Bb (Indirect)

~~+[illegible] +69 +74 +63 +67 +~~

| |
|---|
| +74 + 69 |
| +71 + 63 |
| +67 + 58 |

Cover = 38 - 42 mm

Column -> 10b / Cb (Indirect)

| | |
|---|---|
| +116 | +117 |
| +112 | +115 |
| +109 | +110 |

Cover = 32 - 38 mm.

The Measurements on this page were taken on .....



04/02/2022

Flat No - 1002

Beam -> 2b-3b / Cb (Direct) UPVT

+81 + 81 + 83 + 81 + 85

DL = 280

Cover = 42 - 56 mm

Slab -> Cb-Bb / 2b-3b

| | | |
|---|---|---|
| 34 | 38 | 38 |
| 40 | 36 | 34 |
| 38 | 38 | 38 |

RHT

Cover = 34 - 42 mm.

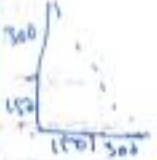
Column -> 3b / Cb (Direct) UPVT

| | |
|---|---|
| +105 | +107 |
| +112 | +89 |
| +106 | +92 |

Cover = 36 - 42 mm

Column -> 2b / Bb (Semi direct)

| | |
|---|---|
| +61 | +202 |
| +61 | +177 |
| +54 | +193 |



The Measurements on this page were taken on 2/2

Cover - 38 - 46 mm

04/02/2023

Slab - 4b-5b / Ab-Bb

| | | |
|---|---|---|
| 38 | 36 | 38 |
| 38 | 38 | 36 |
| 36 | 36 | 36 |

Flat No - 1003

Beam → 3b-2b / Kb (Indirect)

DL = 310 mm

+102 +100 +103 +96 +99 +

Cover = 44 - 98 mm

Slab → Lb-Kb / 2b-3b

| | | |
|---|---|---|
| 32 | 34 | 34 |
| 34 | 36 | 34 |
| 34 | 36 | 34 |

Cover = 41-52 mm

Column → 3b / Kb

+141 +131 ~~+186~~

+139 +156

+135 +136

Slab → 2b-Kb / 3b-4b

Cover = 34-42 mm

| | | |
|---|---|---|
| 40 | 44 | 42 |
| 44 | 44 | 42 |
| 42 | 40 | 44 |

RHT

Wallcell (Lb-3b / Bb)

Calculations not

-260 - 320 = 280

~~-300 - 280 = 260~~

-280 - 320 = 300

The Measurements on this page were taken on .....

(80)

04/02/2023

11th Floor

Flat No ~~1004~~ 1101

Beam → Cb / 10b - 11b (Direct)

+60 +62 +63 +65 +63

Cover = 34 - 53 mm

DL = 240 mm

Slab → 10b - 11b / Bb - Cb

| | | |
|---|---|---|
| 34 | 32 | 42 |
| 34 | 36 | 40 |
| 34 | 36 | 38 |

Cover = 39-47 mm

RHT

Column → 10b / Cb (Indirect)

(Cover - 44 - 64 mm)

+99 +98 +92

+93 +141 +250

+182 +270 +87

Column → 11b / Ab (Indirect)

+67 +57

+63 +63

+67 +66

+62 +62

DL = 250 mm

Slab → 10b-11b / Eb-Cb

Cover = 28 - 32 mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 34 | 34 | 32 |
| 32 | 32 | 32 |

RHT

The Measurements on this page were taken on .....

(81)

04/02/2023

Tower B 12th Floor

Flat No → 1201

am → Cb / 10b - 11b (Direct)

+89 +88 +90 +94 +95

Cover = 48-56mm
PL = 280 mm

2b → Cb - Eb / 10b - 11b

| | | |
|---|---|---|
| 38 | 36 | 38 |
| 36 | 36 | 36 |
| 40 | 36 | 34 |

Cover = 54 - 56mm

Column - 11b / Bb (Indirect)

Cover = 51 - 62mm

| | |
|---|---|
| +69 | +62 |
| +63 | +82 |
| +70 | +68 |

ab → ab - 10b / Ab - Bb

Cover = 34 - 42mm

| | | |
|---|---|---|
| 36 | 38 | 40 |
| 36 | 36 | 40 |
| 38 | 40 | 34 |

RHT

Column - 10b / Cb (Indirect)

| | | |
|---|---|---|
| +106 | +100 | +92 |
| +89 | +111 | +115 |
| +114 | +89 | +101 |

Cover = 32 - 48 mm

The Measurements on this page were taken on 4/2



04/02/2023

Tower B 12th Floor

Flat No → 1203

Beam → Kb / 3b - 2b (Direct)

+75 +72 +74 +78

PL = 260 mm

Column → 3b / Kb (Indirect)

| | | |
|---|---|---|
| +101 | +99 | |
| +95 | +103 | |
| +93 | +101 | |

Cover = 58 - 62mm

Slab → 5b - 3b / Kb - 2b

Cover = 22 - 38mm

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 34 | 32 | 36 |
| 34 | 32 | 32 |

Beam - 2b / 5b - 3b

Cover = 34 - 42mm.

Column → 2b / 2b

Cover = 43 - 58mm

Slab - 1b - 2b / 2b - Kb

| | | |
|---|---|---|
| 38 | 34 | 38 |
| 36 | 34 | 38 |
| 38 | 40 | 40 |

RHT

Cover = 32 - 38mm

Column - 2b / Kb (Indirect)

| | | |
|---|---|---|
| +102 | +83 | +81 |
| +84 | +80 | +114 |
| +111 | +73 | +75 |
| +90 | +60 | +111 |

Cover = 38 - 46mm.

The Measurements on this page were taken on 4/2

Tower B 9th Floor 04/02/2023

Flat NO (902)

Beam → 2b-3b/cb

Cover = 35-64 mm.

+85 +91 +90 +90 +95 PL = 240mm

Column → 2b/Bb (Semi direct)

Cover - 48-53 mm

| | |
|---|---|
| +59 | +172 |
| +63 | +170 |
| +60 | +168 |

300, 15, 150, 300

lumn → 3B/cb

Cover = 76 - 94mm

lab = 2b-3b / Bb-cb

Cover = 44+54 mm

| | | |
|---|---|---|
| 32 | 34 | 30 |
| 32 | 32 | 34 |
| 34 | 32 | 32 |

RHT

Slab → 3b-5b/Ab-Db

| | | |
|---|---|---|
| 34 | 38 | 38 |
| 36 | 34 | 32 |
| 36 | 40 | 40 |

Cover 38-48 mm

olumn - 3b/cb (Indirect)

| | | |
|---|---|---|
| +93 | +90 | +94 |
| +90 | +84 | +103 |
| +80 | +60 | +72 |

Column - 2b/Ab (Indirect)

| | |
|---|---|
| +123 | +82 |
| +108 | +93 |
| +93 | +106 |

PL = 250 mm

Cover = 56-59 mm

The Measurements on this page were taken on ..... 4/2

84

04/02/2023

Flat NO - 904

Beam → 10b-11b/2b (UPVT)

+87 +88 +96 +85 +92

PL = 290mm

Cover = 33-64mm

Slab → 8b-11b/10b-11b

Cover — 43-49mm

| | | |
|---|---|---|
| 36 | 38 | 36 |
| 36 | 34 | 34 |
| 32 | 32 | 32 |

RHT

Slab - 9b/10b/8b-2b

| | | |
|---|---|---|
| 30 | 32 | 33 |
| 32 | 34 | |
| 32 | 33 | 34 |

Cover = 33-49mm

Column → 10b/8b (Indirect)

| | |
|---|---|
| +168 | +129 |
| +141 | +135 |
| +132 | +113 |

PL = 300mm

Cover = 38-46mm

Column — 11b/2b (Indirect)

| | |
|---|---|
| +70 | +68 |
| +62 | +65 |
| +66 | +62 |

PL = 200mm

Column → 11b/8b

| | |
|---|---|
| +77 | +86 |
| +85 | +75 |
| +84 | +94 |

PL = 250

The Measurements on this page were taken on ..... 4/2

85

04/02/2023

# Tower (B) 12th Floor common Area.

Column → UPVT → Eb-Fb / 2b-4b | column → UPVT → Hb-Gb / 2b-4b

300

| | |
|---|---|
| +85 +90 +98 +101 | +127 + 130 +130 +116 |
| +95 +92 +84 +98 | +124 + 103 + 107 +106 |
| +83 +100 +86 +95 | +108 + 98 +101 +102 |
| +102 +84 +93 +112 | +138 + 109 +87 +104 |

P2 = 300

Cover : 50 - 67 mm

Slab → 4b-3b / Hb-Eb

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 38 | 38 | 34 |
| 36 | 34 | 36 |

RHT

Cover : 25 - 40 mm

Slab → 4b-3b / Db-Fb

Cover meter = 30 - 38 mm

| | | |
|---|---|---|
| 34 | 36 | 36 |
| 38 | 38 | 38 |
| 36 | 34 | 38 |

RHT

Beam → 4b-3b / Hb (Gb)

(Cover - 42 - 58 mm)

+63 +61 +65 +66 P2 = 240 mm

Beam → 8b-9b / Db-Cb

P2 = 230

+64 +62 +63 +61 +62

Slab - 9b-10b / 9b-Fb

| | |
|---|---|
| + 90 + 84 | Cover = 26 - 39 mm |
| + 83 + 77 | P2 = 300 mm |
| + 110 + 96 | |

The Measurements on this page were taken on ..... 6/2

(86)

04/02/2023

# Tower B 13th Floor Common Area.

Column → Eb-Fb / 9b-11b (UPVT)

Cover = 34 - 63 mm

P2 = 300 mm

| | |
|---|---|
| +79 +90 +80 +82 | +94 |
| +104 +101 +113 + 82 | +89 |
| + 83 +86 +96 + 88 | +90 |
| + 88 + 89 +89 + 86 | +83 |
| | +88 |

Semidirect.

Column → Hb-Gb / 9b-11b (UPVT)

Cover = 74 - 88 mm

P2 = 300 mm

200

200

Beam → 9b-10b / Eb-Hb (Semidirect)

P2 = 150 mm

+44 +52 +52 +49 +61

Column → Eb-Fb / 9b-11b

Semidirect

P2 = 250 mm

| |
|---|
| +79 |
| +51 |
| +78 |
| +75 |
| +78 |

Semidirect.

Beam

~~Slab~~ → 8b-9b / Jb-Kb

Direct

P2 = 230 mm Cover 42-54 mm

+61 +64 +69 +63 +76

Slab → 9b-10b / Jb-Kb (Indirect)

P2 = 300 mm Cover = 32 - 43 mm

+73 +76 ~~+88~~

+75 +76

+72 +78

| | | |
|---|---|---|
| 40 | 38 | 38 |
| 36 | 32 | 40 |
| 36 | 40 | 38 |

The Measurements on this page were taken on ..... 4/2

(87)

04/02/2023

Slab → Refuse Area – 8b-10b/Cb-Bb

Cover = 30-43mm

| | | |
|---|---|---|
| 36 | 36 | 34 |
| 35 | 36 | 36 |
| 34 | 38 | 38 |

LHT — RHT

UPVT (Indirect)

+70 +73
+68 +65
+73 +65

PL = 300

Tower B | 4th Floor Common Area

Slab – 8b-7b/2b-Kb

Cover = 35-45mm

| | | |
|---|---|---|
| 34 | 32 | 38 |
| 34 | 34 | 32 |
| 38 | 32 | 34 |

LHT

UPVT

+68 +70
+69 +77
+74 +80

Indirect

Slab → 4b-9b/Db-Cb

Cover = 30-42mm

| | | |
|---|---|---|
| 34 | 36 | 36 |
| 36 | 34 | 36 |
| 36 | 36 | 38 |

Beam – 4b/Db-Cb

Cover = 63-68mm

+66 +69 +68 +68 +70 +69

PL = 240mm

The Measurements on this page were taken on ..... 4/2 (88)

Tower (B)

06/02/2023

7th Floor

Flat NO (707)

Beam → 17mm-54mm → 10b-11b/Cb

Slab → 38mm-44mm → 10b-11b/Cb-Eb

Slab → 10b-11b/Cb-Eb

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 34 | 36 | 32 |
| 34 | 36 | 36 |

RHT

Beam → 10b-11b/Cb (Direct)

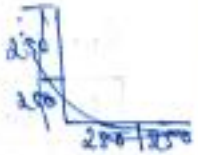
+67 +64 +65 +91 +90

PL = 250mm

Column – 11b-Ab (UPVT)

+77 +76
+76 +86
+80 +74.

Indirect)




Slab – 8b-10b/Ab-Bb

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 32 | 36 | 32 |
| 34 | 34 | 36 |

RHT

Cover – 34 – 42mm

Beam – 28-48mm (Bb/8b-10b)

The Measurements on this page were taken on ..... 8/2 (89)

Column → UPVT - 11b/8b (Semi Direct)

| | |
|---|---|
| +54 +168 | OPUT |
| +54 +162 | |
| +51 +157 | |

## 12th Floor

Flat NO = 1204

Beam → 10b-11b/12b (Direct)
Cover = 48-54mm
PL = 260mm

+78 +70 +70 +72 +70

Beam → 10-12b
Cover = 61-66mm

| | |
|---|---|
| +91 +84 | Indirect |
| +83 +93 | |
| +90 +98 | |

Slab = 10b-11b/12b-12b
Cover = 44-50mm

| | | |
|---|---|---|
| 42 | 40 | 38 |
| 40 | 40 | 38 |
| 38 | 40 | 40 |

Slab → 11b-12b/12b-12b
Cover = 35-44mm

| | | |
|---|---|---|
| 36 | 36 | 36 |
| 34 | 38 | 32 |
| 36 | 34 | 42 |

Beam (12b/11b-12b)
Beam → 42-52mm

The Measurements on this page were taken on 06/2

(90)

06/02/2023

## Tower B 13th Floor

Flat NO = 1303 (1303)

Beam = 3b-2b/1b
PL = 240mm cover = 28-34mm

+65 +65 +68 +70 +67

Column → 2b/1b
Cover = 41-46mm
PL = 250 mm

| | |
|---|---|
| +76 +78 | Indirect |
| +92 +94 | |
| +90 +88 | |

Column → 2b/1b (Indirect)
PL = 300mm

| | |
|---|---|
| +80 +89 +86 +76 | |
| +82 +86 | |
| +76 +82 | |

Column → 2b/1b (Semi Indirect)

| | |
|---|---|
| +54 +178 | Semi direct |
| +62 +177 | |
| +54 +170 | |

Column - 3b-1b
Cover = 60-68mm

Slab - 3b-2b/2b-1b
Cover = 43-63mm

| | | |
|---|---|---|
| 36 | 48 | 44 |
| 38 | 38 | 46 |
| 44 | 48 | 46 |

RHT

Slab → 1b-2b/1b-2b
Cover = 42-58mm

| | | |
|---|---|---|
| 30 | 32 | 28 |
| 32 | 34 | 32 |
| 30 | 30 | 34 |

RHT

The Measurements on this page were taken on 06/2

(91)

Tower (B) 13th Floor 06/02/2023

Flat NO - (1301)

Beam -> Cb/10b - 11b

+81 +82 +79 +82 +92

PL = 260mm

Beam -> Bb - Bb/10b

Cover = 43-52

Slab -> 8b-10b/Ab-Bb

Cove = 43-54 mm

| | | |
|---|---|---|
| 32 | 32 | 34 |
| 34 | 38 | 34 |
| 38 | 38 | 36 |

Column -> 10b/Cb (Inclined)

Cover - 62-72mm

+88 +94
+154 +87
+94 +96

Slab -> Bb-Cb/11b-12b

Cover = 42+48 mm

| | | |
|---|---|---|
| 32 | 34 | 38 |
| 36 | 32 | 34 |
| 38 | 36 | 38 |

RHT

+68 +71
+62 +76
+84 +76

UPVT (Inclined)

The Measurements on this page were taken on 06/02

Tower B 13th Floor

Flat NO -> (1302)

Beam -> 2b-3b/Cb

68 +68 +70 +71 +70

PL = 260mm

Cover = 38-52mm.

Slab -> 3b-4b/Bb-Cb

Cover = 36-42mm

| | | |
|---|---|---|
| 32 | 38 | 34 |
| 34 | 32 | 34 |
| 38 | 36 | 38 |

Beam -> Bb/3b-5b

Cover = 42-54mm

Column -> 3b-Cb

+93 +100
+97 +109
+93 +91

UPVT - Indirect

Column -> 2b/Bb (Inclined)

+95 +98
+89 +90
+89 +89

PL = 300mm

Slab -> 2b-11b/Ab-Bb

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 36 | 34 | 36 |
| 34 | 32 | 36 |

The Measurements on this page were Taken on 06/02

Tower (B) 14th Floor.

Flat No - (1404)

-> 11b-10b/Kb

+81 +81 +83 +98

P2 = 280mm

Slab -> 10b-11b/Kb+Lb

Cover - 25-45mm

| | | |
|---|---|---|
| 24 | 28 | 30 |
| 30 | 24 | 28 |
| 30 | 28 | 30 |

RHT

Slab -> 9b-10b/Mb-2b

Cover = 44-52mm

| | | |
|---|---|---|
| 30 | 36 | 32 |
| 30 | 32 | 32 |
| 34 | 32 | 34 |

Column = 10b/Kb

Cover - 49-54mm

| | |
|---|---|
| +98 | +99 |
| +101 | +97 |
| +106 | +106 |

P2 = 300mm

Slab -> 11b-Kb/11b-12b

UPVT (Indirect)

| | |
|---|---|
| +89 | +98 |
| +99 | +86 |
| +100 | +98 |

P2 = 300mm

Cover = 48-58mm

The Measurements on this page were taken on 06/02

Tower (B) 14th Floor

Flat No (1402)

Beam -> 2b-3b/Cb

Cover = 29-54mm

+65 +64 +65 +70 +73

P2 = 250mm

Slab -> 2b-3b/Bb-Cb

(Cover = 42-54mm)

| | | |
|---|---|---|
| 34 | 36 | 38 |
| 36 | 38 | 40 |
| 34 | 40 | 38 |

Column -> 2b/Ab (Indirect)

P2 = 300mm

| | |
|---|---|
| +67 | +60 |
| +69 | +72 |
| +72 | +59 |

UPVT (Indirect)

The Measurements on this page were taken on 07/02

Slab - 3b-4b/Ab-Bb

Cover = 26-48mm

| | | |
|---|---|---|
| 28 | | |
| | | |
| | | 34 |

Beam -> 3b-4b/Bb

Cover = 38-50mm

Column -> 3b/Cb (Semidirect)

| | |
|---|---|
| +73 | |
| +76 | |
| +71 | Semidirect |
| +78 | |
| +71 | |

Tower (B) With Floor 06/02/2023

Flat -> 1401

Beam -> Cb/lob - llb

Cover - 29 - 38mm

~~89~~ + 91 + 97 + 98 + 92

D2 = 290mm

Slab -> lob - llb/Bb - Cb

Cover = 48 - 56mm

| | | |
|---|---|---|
| 28 | 28 | 30 |
| 28 | 34 | 32 |
| 34 | 32 | 36 |

R+T

Slab -> lob lcb (Inclined)

| | |
|---|---|
| +83 | +87 |
| +84 | +88 |
| +83 | +81 |

Inclined

slab = llb-12b/Bb-cb

Cover = 42-54 mm

| | | |
|---|---|---|
| 28 | 32 | 30 |
| 34 | 28 | 30 |
| 32 | 34 | 32 |

R+T

Column -> llb/Bb (Semi detail)

| |
|---|
| +68 |
| +65 |
| +60 |

"The Measurements on this page" were taken on 06/02

09/02/2023

1004
1001
1002
1003
1101
1201
1203
902
904

} 9 + 3 Common Area. (12+13+14)

P- 401 & 404 - 4th floor

502 - 5th floor

~~601~~, 603, 609 - 6th floor

701 702 - 7th floor

802, 804 - 8th

902, 904 - 9th

completed - 10th.

1102, 1103 1104 - 11th

1202, 1204 - 12th

1301 1302 1303 1304 - 13th.

~~1403~~ - 14th

1501 1502 1503 1504 - 15th floor

31-01-2023

TOWER-'C' Ground Floor

Slab-Ac-Bc/9c-10c ⟶ Reripod Test

+61 +65 +67 +65 +70 +
+64 +66 +63 +67 +70 +
+72 +65 +70 +72 +67 +
+73 +64 +71 +68 +72 +
+80 +76 +80 +63 +68 +
+72 +78 +74 +76 +69 +

72, 78, 67, 62

Raft

| | | |
|---|---|---|
| 46 | 44 | 44 |
| 42 | 48 | 46 |
| 44 | 40 | 42 |

Reripod

Beam - Bc/10c-11c

48, 54 59 64 70

Beam- Bc/10c-11c (180-91)

+50 +46 +51 +52 +52 +47 +48 +46 +47 + 46

Beam- Bc-Cc/10c (230)

+54 +59 +58 +57 +55 +57 +58 +59 + 55

The Measurements on this page were taken on ..... 1/2/1

The Measurements on this page were taken on ..... 1/2

Tower-C 31-1-2023

C#103 1st Floor

UPVT

Column - Kc/c3 (230) → 52, 58 60 54 72

73, 71, 70

Slab - RHT - Hc-Kc/2c-3c

| | | |
|---|---|---|
| 32 | 30 | 32 |
| 32 | 38 | 34 |
| 34 | 34 | 30 |

→ 60, 74 76 85

(300) 51, 60, 63 64

Slab - Mc-Lc/2c-3c → 58, 72, 78, 69

(300) 60, 64 62 66

RHT

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 36 | 38 | 36 |
| 34 | 34 | 34 |

The Measurements on this page were taken on .....

Pg-02

Tower-'C' - 1st Floor 31-01-2023

(9) Flat # 102 - Slab - RHT - 12c-11c/Hc-Lc

| | | |
|---|---|---|
| 42 | 42 | 44 |
| 42 | 40 | 40 |
| 40 | 42 | 46 |

(10) Resipad Test:- 52, 56, 48, 44,

Resipad Test

(16) Column Ec/2c

Resipad Test:- 46, 50, 56 48

(17) Column - Bc/5c

50, 46 48 42 54 56

(11) C#104 - Slab - Hc-Kc/10c-11c

| | | |
|---|---|---|
| 38 | 40 | 42 |
| 42 | 40 | 38 |
| 40 | 42 | 42 |

(12) UPVT - 72, 74, 80, 82

(13) Resipad Test:- 52, 47 49 57

(14) Slab Dc-Cc/4c-5c (300)

71, 75, 79, 73

(15) RHT

| | | |
|---|---|---|
| 38 | 42 | 40 |
| 40 | 46 | 42 |
| 40 | 42 | 40 |

(18) Beam - Kc/10c-11c (230)

57, 59 57

(19) Column - Kc/10c (230)

64, 70, 74, 78

(20) Resipad Test:- 54, 60 56, 58,

(21) Beam - Cc-Dc/9c (230)

56, 59, 57

(22) Beam Kc-Jc/4c (230)

56, 59, 60, 54

(23) Beam Hc/3c-4c (230)

61, 60, 59, 58

The Measurements on this page were taken on .....

Pg-03

2nd Floor

31/01/2023

UPVT

: #201 UPVT

Column - Cc/10c (230)

68, 74, 71,

Slab - Ac-Bc/11c-12c (300)

70, 76, 80, 78

(6)

RHT

| | | |
|---|---|---|
| 40 | 38 | 34 |
| 36 | 38 | 40 |
| 42 | 42 | 38 |

Resipad Test: 54, 60 72 64 78

Slab - DC-5c-8c

RHT

| | | |
|---|---|---|
| 40 | 38 | 42 |
| 36 | 42 | 40 |
| 38 | 40 | 38 |

(29) Beam - Cc/10c-11c (230)

59, 60, 57, 61

(30) Beam - DC-cc/4c (230)

56, 59, 60, 61

(31) Beam - Kc-Hc/11c (250)

71, 70, 74, 72

(32) Resipad Test.

(33) Column - cc/10c (300)

52, 57, 59 66

(34) Beam - Kc-Hc/11c

47, 54, 61, 57

The Measurements on this page were taken on 31/1

Pg-04

2nd Floor.

31/01/2025

C #202 - UPVT

(35) Slab-BcCc/2c-3c (300)

54, 52, 48, 50.

| | | |
|---|---|---|
| 40 | 32 | 38 |
| 30 | 36 | 38 |
| 32 | 34 | 32 |

RHT.

(36) Beam - cc/2c-3c (230)

57, 63, 59, 61

(37) Column - Cc-3c (230) → Resipad Test:

74, 70 76, 72

47, 54, 57, 61

(38) Slab - RHT - Ac-Bc/1c-2c

RHT

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 34 | 32 | 32 |
| 30 | 30 | 36 |

The Measurements on this page were taken on 31/1

Pg-05

2nd Floor 31-1-2023

C # 203

(42) RHT

Slab - MC-2C/1C (300) → 34 36 30 / 40 36 42 / 32 30 32

52 53 54 50 (Indirect)

Column - MC/2C (300) Subdivide

70, 76 60 74. → (43) Resipod

54, 50 60 56 54.

Slab. KC-HC/2C-3C ← Slab.

(44) 44, 52, 58, 50, 48,

30 36 32 / 40 36 34 / 34 40 34

The Measurements on this page were taken on 31/1

Pg-06

3rd Floor 31-01-2023

UPVT Resipod Tilt

(45) Beam - CC-DC/9C (PL-250) (50) column - KC-2C

73, 72, 75 71 47 56 74 70

(51) column KC/3C

56, 58 64 72

(46) Slab - AC-BC/6C-8C

46 40 42 / 40 44 42 / 42 40 46

(52) Slab KC-GC/3C-4C

74 68, 60, 58

(47) Beam. EC/3C-43 (230) (53) Beam KC/2C-3C (260)

84, 86 80 89

56 54 52 51

UPVT - C # 303

C # 303 -

(54) Slab - KC-GC/3C-4C (PL-300)

58, 53, 53 60

(48) column - KC/2C

Semi direct (PL-150x150)

150 150

56, 61 60 58

~~Beam KC~~

84

(55) 42 44 42 / 40 42 40 / 40 44 40 RHT.

(49) Slab - MC-2C/1C-2C (250) ~~RHT~~

57, 61, 64, 55,

~~Beam~~

(56) 40 40 44 / 42 42 42 / 44 42 40

The Measurements on this page were taken on 31/1

Pg-07

TOWER 'C' 3rd Floor. 01-02-2023

#C 304 UPVT

(60) Resiped Test.

) Column. KC-10c (P1-250) → 70 74 68 72

71, 79, 82, 80,

) Beam - KC-10c-11c (P1-250) →

66, 71, 68, 72

) Slab - KC-LC/10c-11c (300) → (61) 64 70 74 58

53, 55, 59, 57,

(62a)

| | | |
|---|---|---|
| 42 | 38 | 40 |
| 40 | 42 | 42 |
| 38 | 42 | 40 |

#C 301 UPVT ~~3rd floor~~

(63) Slab Ac-Bc/11c-12c (300)

74, 69, 80 71

Column - Ac/11c

+73 +72 +

+94 +76 +

+71+74+

Individ

(64a)

| | | |
|---|---|---|
| 34 | 42 | 38 |
| 40 | 36 | 40 |
| 42 | 36 | 40 |

Beam. Bc-cc/11c (300)

Individ.

65, 78 70 74

(65) Resiped Test

78 76 72

Beam KC-JC/4C(280)

64, 62, 60.

(66) Column. Ac/11c

58, 68, 78 70

The Measurements on this page were taken on ..... 01/02

8

4th Floor 01-02-2023

#C 401 UPVT

Resiped

(67) Beam - CC/10c (P1-250)

69, 67, 65, 66

(68) Slab - EC-CC/10c-11c → (71) 72, 76, 80, 74.

58, 54, 60, 64

(69)

| | | |
|---|---|---|
| 40 | 42 | 36 |
| 42 | 40 | 38 |
| 38 | 40 | 38 |

RHT

(70) Column - CC/11c (150x150) → (72) 74, 68 78, 59

Semi divict

54, 55, 57, 54.

150 150

UPVT Beam DC-CC/4C (350)

67 68 70 65

3rd Floor

#C 302

Column - Ac/2c (100x100)

Semidivict

40. 39, 38, 41.

Beam-Bc-cc/2c ~~Balcony~~ (300)

67, 65, 62, 66

Slab - Ac-Bc/2c-3c

Slab ~~Col~~ Bc-cc/1c-2c

68, 65. 64 61

| | | |
|---|---|---|
| 40 | 36 | 32 |
| 34 | 34 | 40 |
| 38 | 36 | 40 |

RHT

Beam - CC-BC/8C (260)

| | | |
|---|---|---|
| 40 | 32 | 38 |
| 34 | 34 | 40 |
| 38 | 38 | 40 |

The Measurements on this page were taken on ..... 01/02 64 65 65

9

01-02-2023

4th Floor

# C402

UPVT

Rebound Test

) Beam - Cc/2c-3c (250)

78, 76, 79, 80

) Column - Cc/c3 (258) (78) → 80, 84 78, 83

80, 74, 79, 81

) Slab - CC-Bc/2c-3c (Pl-250)

61, 58, 65 60

) Slab - Cc-cc/2c-3c

| | | |
|---|---|---|
| 38 | 36 | 38 |
| 40 | 80 | 40 |
| 38 | 38 | 36 |

RHT

The Measurements on this page were taken on ..... 01/02



4th Floor

01-02-2023

# C403

UPVT

Rebound Test

(76) Slab. Lc-Kc/3c-4c

| | | |
|---|---|---|
| 40 | 38 | 36 |
| 36 | 42 | 38 |
| 38 | 36 | 40 |

RHT

(77) Beam - Kc/2c-3c (250)

71, 78, 75, 73

(78) Column - Kc/2c

Semi dirict (150x150)

55, 62, 60, 63

(79) Slab - KC-Hc/2c-3c

| | | |
|---|---|---|
| 40 | 38 | 32 |
| 36 | 34 | 40 |
| 40 | 38 | 42 |

RHT

(80) Column Kc/2c

74 72 80 78.

(81) Column Kc/3c

90, 79 86, 89

The Measurements on this page were taken on ..... 01/02

Tower-C' 4th Floor

01-02-2023

) # 404 UPVT

Slab Lc-Kc/Bllc-12c

| | | | |
|---|---|---|---|
| 40 | 42 | 38 | |
| 36 | 36 | 39 | RHT |
| 36 | 38 | 42 | |

Beam - Kc/10c-11c (240)

78, 76 75, 80

Column - Kc/11c

Semi direct (150x150)

56, 55, 60

) Slab - Mc-Lc/10c-11c

61, 57, 58, 60.

| | | | |
|---|---|---|---|
| 40 | 38 | 34 | |
| 36 | 40 | 42 | RHT |
| 38 | 44 | 36 | |

(89) Slab - Dc-cc/5c-9c

| | | | |
|---|---|---|---|
| 40 | 46 | 44 | |
| 42 | 42 | 44 | RHT. |
| 40 | 44 | 40 | |

(90) (pl-300)

70, 76 74 72 76

(91) Beam - Kc-Jc/9c (230)

59, 60, 65.

The Measurements on this page were taken on 01/02

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01-02-2023

5th Floor

(92) # C 601

UPVT

Slab - Ac-Bc/11c-12c

55, 60, 62 56

(93)

| | | | |
|---|---|---|---|
| 34 | 32 | 32 | |
| 34 | 30 | 32 | RHT |
| 36 | 36 | 34 | |

(94) Beam - Ec/11c-12c (240-P)

66, 63, 65, 70

(95) column - Ac/12c (100x100)

Semi direct

43, 42, 39 40.

(96) Slab. Cc-Bc/6c-8c

| | | |
|---|---|---|
| 34 | 30 | 32 |
| 34 | 32 | 30 |
| 30 | 32 | 34 |

Revised Ast

(97) 72, 80 76 70

(98) 68 64 76 79

The Measurements on this page were taken on 01/02

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5th Floor 01-02-2023

# C 503 UPVT

Resipad 72

Semidirict
column - Hc/2c (130x130) — (105) 68, 73 76 79

43. 45, 39, 49

Beam - Kc/2c-3c (240) → (106) 74, 59, 58, 79, 81

63, 66, 68, 65.

(106) Slab - Lc-Kc/2c-Cc (300)

67 68 72 70.

Slab - Hc-Kc/1c-2c

| | | |
|---|---|---|
| 36 | 40 | 32 |
| 42 | 40 | 42 |
| 38 | 42 | 34 |

RHT

(107)

| | | |
|---|---|---|
| 40 | 38 | 42 |
| 42 | 44 | 36 |
| 38 | 40 | 38 |

RHT

Slab Mc-Lc/2c-3c —

64, 60, 61, 59,

(108) Beam - Hc/3c-4c (250)

74 72 78 76.

| | | |
|---|---|---|
| 40 | 40 | 36 |
| 44 | 42 | 34 |
| 30 | 32 | 38 |

RHT

(109) Beam Dc-cc/9c (240)

69 71 74 72

The Measurements on this page were taken on 01/02

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3rd 5th Floor 02-02-2023

(110) # C 502 - UPVT

(111) Beam Cc/2c-3c (Pl-230)

87, 90, 88, 85

(112) column - Ac/c2 (100x100)

Semidirict

34, 50 38, 42

(113) Slab Ac-Bc/1c-2c

72, 68, 75, 78,

(114)

| | | |
|---|---|---|
| 36 | 42 | 32 |
| 38 | 34 | 36 |
| 40 | 38 | 42 |

RHT

Cover Profometer

(115) Beam - Cc/2c-3c

cover - 35 to 40mm.

Column -

(116) Slab - Cc-Ec/2c-3c

30 to 35 25 to 30mm.

(117) Column - Bc/1c-2c

cover - 40 to 50mm.

Resi Pad Test

(118) column - Ce/3c

84, 87, 90

(119) Beam - Bc-Cc/2c

90, 86, 84

(120) column - Cc/6c

74, 58 49 63 70.

The Measurements on this page were taken on 02/02

15

5th Floor Tower - C

02-02-2023

C-504 - UPVT

Rebound Test

) Column - Kc/10c (100x100) → 82 74 90 78

Semidirect

33, 41, 38,

) Beam - Kc-Lc/11c (230)

76, 73, 69 77

) Slab - Lc-Mc/10c-11c (300)

+79 +77 +75 +78

(128) Beam Kc-Lc/10c

78, 84 89 75

(129) Slab - Kc-Lc/ ~~11c~~ 11c-12c ~~12c 10c~~

76 79 84 58

UPVT

(130) Beam Gc-Hc/11c (150x150)

Semidirect

47, 45, 49 51

(124)

| | | |
|---|---|---|
| 32 | 34 | 38 |
| 38 | 36 | 36 |
| 32 | 38 | 34 |

RHT

Proformeter

(131) Slab - Hc-Ec/36-4c (300)

+62 +71 +67 +74

Column - Mc/11c

Cover - 36 to 49 mm.

(122)

| | | |
|---|---|---|
| 42 | 40 | 40 |
| 38 | 40 | 44 |
| 38 | 42 | 44 |

Beam - Kc-Lc/10c

Cover - 39 to 48mm

Slab - Kc-Lc/8c-10c

Cover 28 to 38mm

The Measurements on this page were taken on 2/2

16

6th Floor

02-02-2023

(132) Lift C-601 - UPVT

Rebound Test

(133) Column - Ac/11c (100x100) → (142) 82, 78, 90

46, 52, 50,

(134) Beam - Cc-Ec/11c (240) → (143) 78, 84, 89

68, 70, 72 69

(135) Slab - Bc-Ac/11c-12c (300)

+89 +73 +80 +

(136) Slab - Cc-Ec/11c-12c

| | | |
|---|---|---|
| 38 | 32 | 36 |
| 34 | 32 | 32 |
| 36 | 32 | 34 |

Proformeter

(137) Column - Cc/10c

Cover - 39 to 46mm

(138) Beam - Bc-Cc/10c

Cover - 41 - 46mm

(141) Slab - Bc-Cc/9c-10c

Cover - 28 to 34mm

The Measurements on this page were taken on 2/2

17

6th Floor

02/02/2023

# C-602 - UPVT

(14) column - Cc/2c (150x150)

62, 64, 57.

(5) Beam - Cc/2c-3c (250mm)

75, 74 74 73

(6) Slab - Cc/Bc/1c-2c (300)

+72+71+69+73

(17)

| | | |
|---|---|---|
| 38 | 36 | 34 |
| 36 | 40 | 36 |
| 40 | 34 | 40 |

RHT

Protometer

Column - Bc/2c

cover 48 to 55 mm

Beam - Ac-Bc/~~Cc~~ 2c

cover - 40-50 mm

Slab - Ac-Bc/1c-2c.

Cover 30 to 35mm

Rasiped Test

(151) Beam - Ac-Bc/2c

72, 80, 84.

(152) Slab - Ac-Bc/1c-2c

79, 76, 80.

~~Cover~~

Protometer.

(153) Column - Cc/6c

Cover 60 to 70mm

(154) Beam - Kc-Jc/8c

Cover - 38 to 48mm

(155) Slab - Cc-Ec/9c-10c

Cover ~~42~~ 28 to 39 mm

The Measurements on this page were taken on .....

18

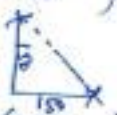
6th Floor

02-2-2023

# C603 - UPVT

(156) Column - Kc/2c (150x150)

66, 68, 79




(157) Beam - Kc/2c-3c (~~250~~ 260)

83, 75, 80, 77,

(158) Slab - ~~Kc/2c~~ Kc-Jc/1c-2c (300)

+79+81+78+

Semidivided

(159)

| | | |
|---|---|---|
| 36 | 38 | 40 |
| 40 | 36 | 36 |
| 34 | 38 | 42 |

RHT

Protometer

(160) Column - Lc/2c

Cover - 46 to 56mm

(161) Beam - Lc/1c-2c

Cover 40 to 50mm

(162) Slab - Mc-Lc/1c-2c

Cover 30 to 40mm

Rasiped Test

(163) 74 79 ~~8~~9, 80

(164) 84 87 90 92

UPVT

(165) Slab - Bc-Cc/6c-8c (300)

(Individual)

+69+73+70.+

(166)

| | | |
|---|---|---|
| 50 | 44 | 50 |
| 44 | 48 | 42 |
| 46 | 44 | 52 |

(167) Beam Jc-Kc/4c (260)

74, 70, 76, 70

The Measurements on this page were taken on .....

19

7th Floor

03-02-2023

Tr C-701 UPVT

Column - CC/10c (100x100) → 90 88, 94 99

Semidirect

100 42 44 41

Beam - CC-DC/12c (250) | Beam Ac-Bc/10c-11c

70, 65, 72 68 | 84 92 96 94

Slab - Ac-Bc/11c-12c (300)

+76+72+74+71

Indirect

| | | |
|---|---|---|
| 34 | 30 | 32 |
| 32 | 32 | 34 |
| 30 | 32 | 31 |

RHT

Slab. Kc-Lc/6c-8c

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 32 | 28 | 34 |
| 30 | 34 | 32 |

RHT

Rosipod Test

Progometer

column - Ac/11c

cover - 40 to 49mm

Beam - EC-CC/11c

cover - 46 to 56mm

Slab - EC-CC/11c-12c

cover. 27 to 35mm.

The Measurements on this page were taken on 3/2



Tower-C 7th Floor

02/02/2023

Tr C-702 - UPVT

Rosipod

Column - Ac/2c (100x100) → 80 79 76 74

100

38, 42, 40, 41

Slab - Ac-Bc/2c-3c

87, 90 78, 74

Beam - Lc/1c-2c (P-230)

87, 88, 85, 81

Slab - Ac-Bc/2c-3c (300)

+93+86+90+86

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 32 | 36 | 34 |
| 34 | 36 | 32 |

Progometer

Column - Bc/2c

cover

Beam - Fc/1c-2c

cover - 40-48mm

Slab - Fc-cc/1c-2c

cover - 35 to 42 mm

The Measurements on this page were taken on 3/2

7th Floor

03-02-2023

# C-703 UPVT

Column - Kc/2c (150x150) → 56, 45, 50, 52

Beam - Kc/2c-3c (270-P1)

75, 79, 80, 76

Slab - Lc-Kc/1c-2c (300)

+63+60+65+61

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 36 | 30 | 32 |
| 34 | 30 | 34 |

Profometer

Column - Mc/2c

cover 38 to 49 mm

Beam - Lc/2c-3c

cover - 40 to 52 mm

Slab - Lc-Mc/2c-3c

cover - 26 to 34 mm

Resipod Test

78 84 90 81

Slab - Lc-Mc/1c-2c

90, 84, 76, 72

Beam - Cc/6c-5c.

74 78 76 80.

UPVT

Beam - Kc-Jc/4c (250)

63, 68, 65,

Beam - Kc-Jc/9c (230)

50, 54, 56,

The Measurements on this page were taken on 6/2



7th Floor

03/02/2023

# C704 - UPVT

Column - Kc/11c (150x150)

Indirect

59, 61, 60, 62

Beam - Kc/11c-12c (250)

67, 73, 70,

Slab - Lc-Kc/10c-11c (300)

+88+86+78+

Indirect

| | | |
|---|---|---|
| 36 | 38 | 36 |
| 40 | 34 | 36 |
| 40 | 38 | 38 |

Profometer

Column - Mc/11c

cover - 36 to 46 mm

Beam - Lc/10c-11c

cover - 36 to 47 mm.

Slab - Lc-Mc/10c-11c

cover - 28 to 38 mm

Resipod Test

Slab - Lc-Mc/11c-12c

78, 92 90 87

Column. Mc/11c

76 84 88 90.

Profometer

Slab. Jc-11c/9c-10c

cover 26 to 36 mm

Beam - Bc/6c-8c

cover 40 to 64 mm

The Measurements on this page were taken on 3/2

2nd Floor

02/02/2023

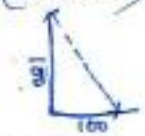
# C-204 UPVT

Resiped Test

Column - Mc/11c (P1-100x100) → 80 82 90 79

Semi direct

37, 30, 35 36




Beam - LC-Mc/10c-11c (240) → Beam - Mc-Lc/11c

77, 78, 75, 77 → 80 78 74 92

Slab - Mc-Lc/11c-12c (300)

+76+73+77+75

| | | |
|---|---|---|
| 42 | 42 | 40 |
| 44 | 38 | 40 |
| 42 | 40 | 44 |

Profometer.

Column - Kc/11c

cover 35 to 42mm.

Beam - Lc-Kc/10c

cover - 30 to 40mm

Slab - Lc-Kc/10c 11c

Cover - 32 - 44 mm.

The Measurements on this page were taken on 2/2

22

8th Floor

03/02/2023

# C-801 - UPVT

Resiped Test

Column - Kc/5c (150x150) → 58 59 64 62

58, 51, 50, 54,

Beam - Kc-Lc/3C (250-P) → 62, 60, 70, 65

72, 71, 70, 74

Slab - Mc/c/2c-3c (300)

+74+76+79+81

| | | |
|---|---|---|
| 31 | 36 | 38 |
| 30 | 34 | 36 |
| 32 | 38 | 32 |

Profometer

Column - cc/9c

cover - 40 - 50mm.

Beam - Cc - Bc/11c

Cover 38 - 48mm

Slab - Bc - cc/11c-12c

Cover - 29 to 39 mm.

The Measurements on this page were taken on 8/2

25

8th Floor

05/02/2023

# C-802 - UPVT

Column - AC/2C (100x100 Semidirect

30, 35, 33, 32,

Beam - BC-CC/3C (250)

70, 74 78

Slab - BC-CC/1C-2C

Indirect (P1-300)

+74 + 76 + 77 +

| | | |
|---|---|---|
| 38 | 40 | 42 |
| 40 | 42 | 40 |
| 42 | 40 | 38 |

Proformeter

Column - AC/2C

Cover - 40 to 48mm

Beam - CC-BC/3C

Cover - 38 to 48 mm

Slab - BC-CC/3C-5C

Cover - 28 to 35mm

Resiped Test

Column - EC/3C

78, 84 82 80.

Slab - BC-CC/3C-5C

86, 92 88 90

Slab - 1C-2C/6C-8C

78 91 83

Proformeter

Slab CC-BC/5C-8C

Cover 28 to 38mm

Beam - CC-DC/4C

Cover 32 to 42mm

Slab BC-CC/5C-8C

Cover 26 to 36mm

| | | |
|---|---|---|
| 32 | 36 | 34 |
| 36 | 38 | 38 |
| 34 | 34 | 38 |

The Measurements on this page were taken on 3/2

26

9th Floor

03/02/2023

# C-901 - UPVT

Column - CC/10C (100x100)

36 32 35 34.

Beam - EC/11C-12C (250)

77, 79, 78 75

Slab - CC-EC/10C-11C (300)

+69 + 72 + 70 + 73 Indirect

| | | |
|---|---|---|
| 32 | 30 | 30 |
| 30 | 34 | 34 |
| 32 | 34 | 30 |

Proformeter

Column - CC/11C

Cover 40-50mm

Beam - BC-CC/11C-12C

Cover 42-50 mm.

Slab - BC-CC/11C-12C

Cover 27 to 37mm.

Resiped Test

77 79 80 78

80 78 84 82

Beam - BC/6C-8C

92, 95, 105, 98,

Beam - CC-DC/4C (250)

69, 71, 73

Beam - BC-CC/9C (230)

61, 66, 64,

The Measurements on this page were taken on 3/2

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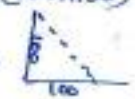
9th Floor

03/02-2023

#902 UPVT

column - Ac/2c (100x100)
Semidirict
28, 30 27 26




Beam - Bc/2C-3C(2600) →
84, 82 86

Slab - Bc-Cc/2c-3c(300)
Endirict
+77+71+75+74

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 32 | 30 | 36 |
| 30 | 36 | 32 |

Profometer

Column- Ac/2c
cover - 36 to 46 mm.

Beam - Bc-Ac/2c
cover - 30-40mm.

Slab - Ac-Bc/1c-2c
cover 27 to 37mm

Resiped Test

column - Cc/3c
78, 80 86 82
80 54 86 90

The Measurements on this page were taken on .....

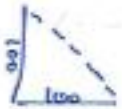


9th Floor

03/02/2023

#C-903 UPVT

column - Mc/2c (100x100) →
Semidirict
36, 40, 38 41,




Beam - Lc-Kc/3c(2 )
76, 74, 80, 77

Slab - Mc-Lc/2c-3c(300)
Endirict
+71 +74 +70+

| | | |
|---|---|---|
| 30 | 36 | 34 |
| 32 | 36 | 36 |
| 34 | 34 | 32 |

Profometer

Column- Cc/2c
cover 35 to 39 mm.

Beam - Mc-Lc/2c
cover 30 to 40mm.

Slab - Mc-Lc/1c-2c
cover - 28 to 38 mm

Resiped Test

80 78 82 76
Slab - Mc-Lc/2c-3c
74 79 83 86

The Measurements on this page were taken on .....

6th Floor

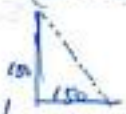
03-02-2023

# C-604 UPVT

Rebound Test

Column - Kc/11c (150x150) —> 80 78 74, 72

79, 72, 74




Beam - ~~Kc~~ Kc-Lc/11c (200) —> 70 76 74 73

74, 69, 70 72

Slab - Kc-Lc/11c-12c (300-Pl)

Endirect

+69 +70 +73+

| | | |
|---|---|---|
| 30 | 32 | 32 |
| 36 | 34 | 34 |
| 38 | 32 | 36 |

Profometer

Column - Kc/11c

Cover - 51 to 60mm

Beam - Lc/10c-11c

Cover 25 to 35mm

Slab - Kc-Lc/11c-12c

Cover 26 to 37 mm

The Measurements on this page were taken on 3/2

30

8th Floor

03-02-2023

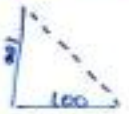
# C-804 UPVT

Rebound Test

Column - Mc/11c (100x100)

Semidirect

30, 34, 32




Beam - Lc/10c-11c (260) —> 84 86 89 92

90, 95, 93

Slab - Kc-Lc/10c-11c (300)

Endirect

+72 +75+72+

| | | |
|---|---|---|
| 36 | 42 | 40 |
| 42 | 36 | 44 |
| 34 | 38 | 42 |

Profometer

Column - Kc/11c

Cover - 38 to 48mm

Beam - Mc/11c-12c

Cover 32 to 42mm

Slab - Mc-Lc/11c-12c

Cover - 26 to 36mm

UPVT

Beam - Ec-Ce/11c (Pl-240)

67, 65, 63

Beam - Ec/9c-10c (240)

62, 68, 70

Slab. Kc-Mc/9c-10c

| | | |
|---|---|---|
| 38 | 34 | 42 |
| 34 | 36 | 36 |
| 32 | 34 | 40 |

KHT

The Measurements on this page were taken on 4/2

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10th floor

04/02-2023

# C-1001 - UPVT

Column - CC/10C(100x100)

Semidirict

50, 47, 41, 46

Beam - BC-CC/11C(250) → 74 76 80

74, 67, 70, 72

Slab - CC-BC/11C (300)

+78 + 75 + 69 + 76

| | | |
|---|---|---|
| 38 | 40 | 34 |
| 36 | 40 | 38 |
| 38 | 40 | 42 |

RHT

Profometer

Column - 2C/12C

Cover - 34-44mm.

Beam - EC/11C-12C

Cover - 38 To 48mm

Slab - FC-GC/11C-12C

Cover - 22 to 34mm

Beam - CC-DC/4C

Cover - 37 to 48mm

Slab - CC-DC/4C-7C

Cover 40 to 50mm

Rasipad Test

BSlab BC-CC/10C-11C

64. 72 70, 67,

UPVT

Beam - HC-KC/11C (230)

60 65 67.

Beam - EC/1C-2C(230)

64 65 61

Slab - JC-KC/4C-9C

| | | |
|---|---|---|
| 42 | 40 | 44 |
| 40 | 36 | 42 |
| 40 | 36 | 38 |

RHT

The Measurements on this page were taken on 4/2

22

10th floor

04-02-2023

# C-1003 - UPVT

Column - KC-3C/2C(Semidirict)

(P1-300) +73+76+ +78+80+ +75+81+ | Indirict → 76 79 83 86

Beam - MC-2C/2C (250) → 74 80 81, 88,

80, 72, 80, 76

Slab - MC-LC/1C-2C(300)

+84+86+82+80

| | | |
|---|---|---|
| 34 | 40 | 30 |
| 38 | 36 | 36 |
| 40 | 38 | 34 |

RHT

Slab KC-HC/3C-5C

74 78, 81 82

Slab KC-LC/5C-8C

| | | |
|---|---|---|
| 38 | 40 | 32 |
| 34 | 36 | 36 |
| 34 | 34 | 34 |

Profometer

Column - KC/3C

Cover - 30 to 40mm

Beam - MC-LC/2C-2C

Cover - 36 to 46mm.

Slab - MC-LC/2C-1C

Cover

The measurements on this page were taken on 4/2

33

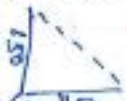
10th Floor

# C-1004 - UPVT

Column Kc/11c (150x150)

Semidirict

65, 66 63




Beam - Lc/10c-11c (250)

68 74 70 72

Slab - Kc-Lc/11c-12c (300)

+63+74+76+70

| | | |
|---|---|---|
| 32 | 40 | 42 |
| 44 | 44 | 40 |
| 38 | 40 | 36 |

RHT

Profometer

Column - Lc/11c

cover - 47 - 57mm

Beam - Lc/11c-12c

cover 40 to 50mm

Slab - Mc-Lc/11c-12c

cover - 30 to 40mm

Rebound Test

→ 74 78 80

→ 77, 84, 82

→ 90, 76, 80 85

Parapet wall MC/5c-8c

77 70 74 72

The Measurements on this page were taken on 4/2



11th Floor

# C-1101- UPVT

Column - Cc/11c (150x150)

60, 65, 68, 70

Beam - Ec/11c-12c (240)

74 73 72 70

Slab - Ac-Bc/11c-12c (300) →

+62+64+63+65

| | | |
|---|---|---|
| 38 | 32 | 36 |
| 34 | 40 | 34 |
| 40 | 32 | 30 |

RHT

Profometer

Column - Ac/12c

Cover - 31 to 40mm

Beam - Bc/10c-11c

cover 32 to 42mm

Slab - Ac-Bc/10c-11c

cover 26 to 36mm

Beam - Kc-Jc/4c

Cover - 34 to 42 mm

04-02-2023

Rebound Test

10th floor TO 11th floor

Staircase Slab - Fc/9c/10c-11c

43, 38, 44, 46

56 62 64 58

UPVT

Beam Cc-Dc/4c (250)

70, 79 80 75

Beam - Hc/1c-2c (230)

60, 61, 65 63

Slab Hc-Kc/3c-4c

| | | |
|---|---|---|
| 38 | 36 | 40 |
| 32 | 42 | 42 |
| 34 | 32 | 36 |

RHT

Cover - 26 to 34 mm

The Measurements on this page were taken on 4/2

11th Floor

04-02-2023

C-1102 - UPVT

Column - Ac/2c (100x100)

Semi direct

30, 34 36 32

Beam - Cc-Bc/2c (250)

74, 70, 80

Slab - Bc-cc/8c-3c (300)

+74 +70 +73 +75

| | | |
|---|---|---|
| 34 | 34 | 40 |
| 37 | 40 | 36 |
| 32 | 32 | 36 |

RMT

Rebound Meter

Column - Cc/2c

cover - 41 to 52 mm.

Beam - Ec/1c-2c

cover - 46 to 52 mm.

Slab - Bc-cc/1c-2c

cover - 27 to 32 mm.

Rebound Test

→ 64 60 58 56

Slab - Bc-Ac/2c 3c

70 64 67 61

Slab - Ac-Bc/6c-8c

58 64 70 66

Slab Ac-Bc/6c-8c

| | | |
|---|---|---|
| 40 | 38 | 40 |
| 38 | 36 | 36 |
| 38 | 34 | 42 |

RMT

The Measurements on this page were taken on 4/2



06/02/2023

# C-904 - UPVT

Column - Kc/11c (150x150)

Semi direct

+52+54+51

Beam - Kc-Lc/11c (250)

81, 80, 75, 84

Slab - Hc-Kc/11c-12c (300)

+70 +74+72+74

| | | |
|---|---|---|
| 34 | 36 | 32 |
| 32 | 34 | 34 |
| 30 | 34 | 36 |

Column - Mc/11c

cover - 32 to 40 mm.

Beam - Lc-10c-11c

cover - 30 to 40 mm.

Slab - Mc-Lc/10c-11c

cover - 26 to 34 mm

Rebound Test

→ 64, 66 71

→ 70 74 72

The Measurements on this page were taken on 6/2

12th Floor

C-1203 - UPVT

Column - Mc/2c (100x100)

Semidirect

+46 + 44 + 42 + 45

Beam - Lc/2c-3c (250)

+76 + 80 + 83 + 78

Slab - Lc-Kc/2c-3c (300)

+63 + 61 + 70 + 65

| | | |
|---|---|---|
| 32 | 32 | 34 |
| 34 | 36 | 32 |
| 36 | 36 | 38 |

Column - Mc - Lc/2c

Cover - 32 to 44 mm.

Beam - Mc-Lc/1c

Cover - 28 to 38 mm.

Slab - Mc-Lc/1c-2c

Cover - 27 to 33 mm

Resipad Test

Slab - Mc-Lc/3c-4c

39. 44 46 49

→ 58 56 52 54

The Measurements on this page were taken on 6/2

38

12th Floor

06-02-2023

# C-1204 - UPVT

Column - Kc/11c

+53 + 50 + 54 + 57

Beam - Kc/10c-11c

+68 + 65 + 70 + 72

Slab Kc-Lc/11c-12c (300)

+70 + 71 + 74 +

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 30 | 32 | 32 |
| 34 | 34 | 30 |

Perfometer

Column - Lc/11c

Cover - 34 to 38 mm

Beam - Kc-Lc/10c

Cover - 35 to 40 mm

Slab - Mc-Lc/11c-12c

Cover - 26 to 33 mm

Resipad Test

→ 54 50 56 60

Slab - Lc-Kc/11c-12c

30, 28, 35, 32

The Measurements on this page were taken on 6/2

39

12th Floor

C-1202 UPVT

Column - ~~Bc/2c~~ cc/2c (150x150)

Semidivict

+52+54+50+56

Beam - Bc-cc/2c (250)

+78+75+73+76

Slab - Ac-Bc/1c-2c (300)

+59 +57+60+58

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 36 | 34 | 32 |
| 32 | 34 | 30 |

Proformeter

Column - AC/2c

Cover - 44 to 54mm.

Beam - Ec-cc/2c

Cover - 34 to 44 mm.

Slab - Ec-Cc

Cover - 27 to 36 mm.

Beam - Dc-cc/9c

Cover 34 to 44 mm

Slab - Dc-cc/9c-6c

cover - 23 to 32mm.

Resipad Test

→ 54 50 51 58

- Slab Ac-Bc/2c-1c

38 42 40 36

UPVT

Beam Hc/9c-10c (230)

+65+62+60+64

Beam - Cc-Dc/9c (250)

+61+63+62+60

The Measurements on this page were taken on 6/2

40

12th Floor 06-02-2023

#C-1201 - UPVT

Column - ~~Kc/5c~~ cc/9c

+56+54+52+50

Beam - cc/10c-11c (270)

+54+56+90+82

Slab - AC/Bc/11c-12c

+70+72+74+71

| | | |
|---|---|---|
| 32 | 34 | 30 |
| 34 | 36 | 34 |
| 32 | 34 | 36 |

Proformeter

Column - cc/11c

Cover - 45 to 54mm.

Beam - cc/10c-11c

Cover - 37 to 42mm.

Slab - Bc-cc/10c-11c

Cover - 24 to 33mm

Resipad Test

→ 62 58 54 60

Slab - Ac-Bc/8c-10c

38, 44 40 42

Slab - Fc-Gc/9c-10c

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 34 | 36 | 32 |
| 34 | 32 | 34 |

RHT

The Measurements on this page were taken on 6/2

41

11th Floor

C - 1103 UPVT

Column - MC/2C (1000x100)

+40 +44 +42 +52.

Beam - LC-KC/1C-2C (260) →

+64 +66 +71 +70

Slab - MC-LC/1C-2C (300)

+67 +65 +68 +64 (Indirect)

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 38 | 40 | 34 |
| 36 | 32 | 38 |

Column - MC/2C

Cover - 39 - 49 mm

Beam - BC-CC/2C

Cover - 37 to 47 mm.

Slab - LC-KC/2C-3C

Cover - 28 to 38 mm

Rasiped Test

Slab. LC-KC/6C-3C

30, 28 36 40

52, 56 54 50

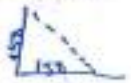
The Measurements on this page were taken on ..... 6/2

11th Floor

C - 1104 UPVT

Column - KC/11C (150x150)

(Semidirict)




+54 +57 +56 +58

Beam - LC-MC/11C (260)

+61 +60 +61 +64

Slab - MC-LC/MC-12C (300)

(Indirict)

+51 +57 +55 +53

| | | |
|---|---|---|
| 42 | 42 | 40 |
| 40 | 42 | 42 |
| 42 | 44 | 40 |

RHT

Column - KC-11C

Cover - 38 to 48 mm.

Beam - KC/11C-12C

cover - 35 to 46 mm

Slab - KC/LC/11C-12C

Cover - 26 to 34 mm.

Rasiped Test

→ 51 54 60 52

Slab - MC-LC/11C-12C

39, 44 42 48

The Measurements on this page were taken on ..... 6/2

13th Floor

C1301 UPVT

Rasipad Test

Column - ~~Bc~~/11c (100x100)

/11c - Semidivict

+40 +41 +44 +43

→ 50 44 48 45

Beam - Bc-cc/11c-10c (P1-250)

+73+77+81+

Slab - Bc-cc/6c-9c

48 54 58 56 51

Slab - Ac-Bc/10c-11c (300)

+71 +74 +75 + (Indivict)

| | | |
|---|---|---|
| 44 | 42 | 42 |
| 40 | 40 | 44 |
| 42 | 40 | 42 |

RHT

Column - Ac/11c

Cover -

Beam - cc/10c-11c

Cover - 43 to 49mm

Slab - Dc-cc/10c-11c

Cover - 24 to 34mm

The Measurements on this page were taken on 6/2

13th Floor 06/02/2023

#C-1302 UPVT

Rasipad Test

Column - Ac/2c (100x100)

Semidivict

+30+33+35+32

Slab - Ac-Bc/1c-2c

39, 46 44.51

Beam - Ac-Bc/1c-2c (250) → 58 64 60 55

+69+73+71+74

Slab - Ac-Bc/1c-2c (300)

+64 +68 +71 +66

| | | |
|---|---|---|
| 40 | 44 | 42 |
| 42 | 38 | 40 |
| 40 | 42 | 44 |

RHT

Proformeter

Column - Ac/2c

cover - ~~Ac~~ 39 to 47mm

Beam - Bc/3c-5c

Cover - 37 to 47mm

Slab - Ac-Cc/3c-5c

Cover - 25 to 30mm

The Measurements on this page were taken on 6/2

45

13th Floor

06/02/2023

C - 1304 UPVT

Column - KC/11C (150x150)

(Semidirict)

+67 +63 +65 +58

Beam - KC/10C-11C (260)

+81 +78 +75 +80

Slab - LC-KC/11C-12C (300)

(2wdirict)

+58 +51 +55 +52

| | | |
|---|---|---|
| 46 | 44 | 48 |
| 42 | 44 | 42 |
| 46 | 42 | 44 |

RHT

Proformtey

Column - MC/11C

Cover -

Beam - KC/10C-11C

Cover - 40 to 80 mm

Slab - LC-KC/10C-11C

Cover - 24 to 33 mm

Rebound Test

→ 42 44 48 38

Slab - LC-KC/8C-10C

38 50 46 49

The Measurements on this page were taken on .....

46

14th Floor

06-02-2023

#C-1403 UPVT

Column - MC/2C (100x100)

Semidirict

+32 +34 +35 +32

Beam - KC/2C-3C (P/-250)

+84 +86 +81 +82

Slab - HC-KC/2C-3C (300)

+61 +70 +72 +73

| | | |
|---|---|---|
| 34 | 38 | 32 |
| 38 | 36 | 34 |
| 36 | 38 | 32 |

RHT

Proformtey

Column - KC/2C

Cover - 36 to 43 mm

Beam - MC-LC/2C

Cover - 38 - 45 mm

Slab - LC/KC/2C-3C

Cover - 24 to 32 mm

Beam - KC-JC/4C

Cover - 40 to 80 mm

Slab - KC-JC/4C-8C

Cover - 23 to 34 mm.

Rebound Test

→ 48 50 54 51

Slab - MC. LC/1C-2C

38 35 39 42

UPVT

Beam - CC-DC/9C (P/-250)

+61 +64+62+63

Beam - HC/1C-2C (240)

+61 +58 +62 +60.

The Measurements on this page were taken on .....

47

14th Floor

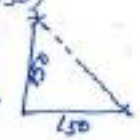
06-02-2023

C-1402 UPVT

Column - Cc/2c (150x150)

(Semidirect)

+50 +54 +52 +53




Beam - Bc-Cc/3c

+80 +81 +83 +85

Slab - Ac-Bc/1c-2c (300)

(Indirect)

+66 +67 +68 +70

| | | |
|---|---|---|
| 30 | 34 | 32 |
| 32 | 30 | 34 |
| 34 | 32 | 30 |

Proformeter

Column - Cc/2c

cover - 34 to 46mm

Beam - Cc/3c-2c

cover - 35 to 48mm

Slab - Cc/Bc 1c-2c/Cc-Bc

cover - 22 to 33mm

Resipad.

Slab - Bc-Ac/1c-2c

54 50 47 58

→ 60 56 53 51

UPVT

Slab - Bc-Cc/6c-8c

| | | |
|---|---|---|
| 30 | 34 | 36 |
| 32 | 30 | 32 |
| 34 | 36 | 34 |

RHT

The Measurements on this page were taken on 6/2

(48)

16th Floor

07-02-2023

# C-1601 UPVT

Column - Cc/11c (150x150)

(Semidirect)

+66 +68 +67 +65

Beam - Bc-Cc/10c (P1-260)

10c-11c

+73 +76 +72 +77

Slab - Ac-Bc/11c-12c (300)

(Indirect)

+65 +70 +67 +69

| | | |
|---|---|---|
| 38 | 32 | 34 |
| 32 | 34 | 38 |
| 34 | 38 | 32 |

RHT

Proformeter

Column - Ac/11c

cover - 40 - 50mm

Beam - Bc-Cc/11c

cover - 30 to 44mm

Slab - Bc-Cc/11c-10c

cover - 24 to

Resipad Test

→ 60 54 50 57

Slab - Ac-Bc/8c-10c

50 52 48 46

The Measurements on this page were taken on 07/2

(49)

16th Floor

1603 UPVT

Rasipad Test

Column - Kc/2c (150x150)
(Semidirict)

65 64 63 68
+85 +84 +78 +78

Beam - Mc-Lc/2c (258) ——> 60 57 54 51
+74 +75 +78 +81

Slab - Lc-Mc/1c-2c (200)
(Indirict)
+67 + 65 +68 +63

Slab - Mc-Lc/3c-5c
48 54 50 52

Proformer

Column - Mc-2c
cover - 37 to 48mm
Beam - Lc-Mc/2c
cover - 31 to 41mm.
Slab - Mc-Lc/2c-3c
cover - 23 to 34mm

The Measurements on this page were taken on 07/2

50

17th Floor

07-02-2023

#1702 UPVT

Rasipad Test

Column - Cc/3c
(semidirict)

+46 +50 +48 +43
Beam - Bc-Cc/3c (250)
+64 +68 +66 +62
Slab - Ac-Bc/1c-2c
+65 +63 +61 +60
(Indirict)

| | | |
|---|---|---|
| 40 | 42 | 44 |
| 44 | 40 | 42 |
| 42 | 44 | 40 |

RHT

Proformer

Column - Ac/2c
cover - 45 to 55mm
Beam - Cc/2c-3c
cover - 35 to 45mm
Slab - Ec-Cc/2c-3c
cover - 24 to 34mm.

-> 54 50 48 52

Slab Ac-Bc/1c-2c
86 84 80 82

The Measurements on this page were taken on

51

17th Floor

# C-1703 UPVT

Column – Kc/2c (15mm)
(Semidirect)

+51 +60 +55 +53

Beam – Kc/2c-3c (Semi- ) → 47 49 54 52

+54 +58 +91 +86

Slab – Kc-Lc/2c-3c (300)
(Indirect)

+70 +71 +74 +72

| | | |
|---|---|---|
| 28 | 30 | 30 |
| 30 | 32 | 28 |
| 32 | 28 | 30 |

RMT

Proformeter

Column – Lc/2c
Cover – 39 to 48mm

Beam – Mc-Lc/2c
Cover – 34 to 44mm

Slab – Kc-Hc/1c-2c
Cover – 23 to 32mm.

Rebound Test

Slab – Mc-Lc/3c-5c

39, 48 46 41

The Measurements on this page were taken on 7/2



17th Floor

07-02-2023

# C-1704 UPVT

Semidirect
Column – Mc/11c
(Semidirect)

+50 +48 +46+44

Beam – Lc-Kc/11c (300)

+75 + 81 +86+84

Slab – Lc-Mc/10c-11c (300)
(Indirect)

+88+74 +76 +80

| | | |
|---|---|---|
| 32 | 36 | 34 |
| 34 | 38 | 40 |
| 36 | 40 | 36 |

Proformeter

Column – Kc/11c
Cover – 30 to 40 mm

Beam – Kc/11c-12c
Cover – 35 to 45 mm

Slab – Lc-Kc/11c-12c
Cover

Rebound Test

54 56 50 47

Slab – Mc-Lc/10c-11c

56, 38, 34, 50

The Measurements on this page were taken on 07/2

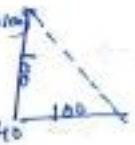
18th Floor

07-02-2023

C-1802 UPVT

Rasipal Test

Column – Ac/2c (Semi dir'ct)




+35 +40 +38 +40

Slab – Ac-Bc/1c-2c

74 78 76 80

Beam – Bc-cc/2c (260) → 54 56 60 67

+58 +77 +26+

Slab – Bc-cc/1c-2c (300) (Indirect)

+66 +67 +65 +

| | | |
|---|---|---|
| 36 | 40 | 38 |
| 36 | 36 | 38 |
| 38 | 36 | 40 |

RHT

Profometer

Column – Ac/2c

Cover – 42 to 52 mm

Beam – cc/2c-3c

Cover – 42 to 52 mm.

Slab – Bc-cc/2c-3c

24 to 33 mm

The Measurements on this page were taken on 07/2

54

15th Floor

07/02/2023

#C-1504

Rasipal Test

Column – Kc/11c (Semidirect)

→ 70 68 74 77

+48 +45 +40+42

Slab – MC-Lc/11c-12c

65 70 68 76.

Beam – Lc-Kc/11c (260)

+71 +74+ 72+75

UPVT

Slab – Lc-Kc/11c-12c (300)

+63 +65 +64+66

Beam – Hc/3c-4c (230)

+64 +66 +65+63

Slab Bc-cc/6c-8c

| | | |
|---|---|---|
| 32 | 30 | 30 |
| 32 | 32 | 32 |
| 30 | 32 | 30 |

RHT

| | | |
|---|---|---|
| 36 | 34 | 38 |
| 40 | 36 | 40 |
| 36 | 38 | 40 |

Profometer

Column – Kc/11c

Cover. 40 to 50mm

Beam – Lc-Kc/11c

Cover – 36 to 44 mm

Slab – Lc-Kc/11c-12c

Cover 24 to 32 mm.

Beam – Dc-cc/4c

28 to 40mm.

Slab – Jc-Icc/4c-8c

25 to 36 mm

Beam – Cc-Dc/9c (250)

+65 +68 + 63+69

The Measurements on this page were taken on 07/2

55

18th Floor

C-1804

Column Mc/11c (Jockey 90)
(Semi district)

+33+39+35+34

Beam — Kc-2c/10c (260)

+78 +80+75+72

Slab — 2c-Mc/11c-12c (300)
(Indirect)

+63 +60+65+64

| | | |
|---|---|---|
| 42 | 42 | 38 |
| 36 | 40 | 40 |
| 38 | 44 | 36 |

Profometer

Column — Kc/11c

Cover - 40 to 50mm.

Beam Mc-2c/11c

Cover - 35 to 39 mm.

Slab — Mc-Kc/11c-12c

Cover 24 to 33 mm.

Resipod Test

→ 60 54 52 56

Slab - 2c-Mc/11c-12c

38 46 42 45

The Measurements on this page were taken on 07.2.

(56)

19th Floor

07-02-2023

#C-1902

Column - Ac/2c
(Semidirect)(Indirect)

+34 + 32+35+36

Beam - Bc/2c-3c(250)

+66+60+64+65

Slab — Ac-Bc/1c-2c (300)
(Indirect)

+71 + 70+68 + 70

| | | |
|---|---|---|
| 32 | 40 | 36 |
| 40 | 38 | 34 |
| 38 | 36 | 40 |

RHT

Profometer

Column - Cc/2c

Cover 38 - 46mm

Beams — Bc-cc/3c

Cover - 37 - 42mm.

Slab — Bc-cc/3c-4c

Cover - 24 to 34mm

Resipod Test

Slab - Ac-Bc/3c-2c

45, 50 64 56

→ 64 60 55 58

The Measurements on this page were taken on 07.2.

(57)

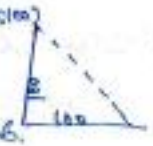
19th Floor

07-02-2023

C-1903

Column – Mc/2c (100×100)

(Semidirect)




+ 34 + 36 + 35 + 36

Beam – Kc/2c-3c

+ 54 + 50 + 56 + 51

Slab – ~~Lc-Kc~~ Lc-Mc/2c-3c (300)

(Indirect)

+ 45 + 48 + 50 + 52

Resiped Test

→ 64 70 73 76

Slab – Lc-Mc/2c-3c

42, 46 49 53

| | | |
|---|---|---|
| 38 | 40 | |
| 44 | 42 | |
| 38 | 44 | |

RHT.

Pacometer

Column – MC/2c

Cover 35 to 45mm

Beam – Lc/2c-3c

Cover – ~~Lc/2c-3c~~ 35 to 43mm

Slab – Lc-Mc/2c-3c

cover 25 to 34mm

The Measurements on this page were taken on 07/2

55

20th Floor

07.02-2023

# C-2002

Column –

(Semidirect)

+ 61 + 60 + 63 + 64

Beam – Cc/2c-3c (260)

+ 85 + 87 + 83 + 85

Slab – Bc-cc/1c-2c

(Indirect)

+ 59 + 55 + 53 + 57

Resiped Test

→ 58 64 56 61

Slab – Ac-Bc/2c-3c

47 53 56 60

Slab – Lc-Kc/5c-8c

| | | |
|---|---|---|
| 38 | 40 | 36 |
| 36 | 38 | 40 |
| 40 | 36 | 38 |

RHT

Pacometer

Column – Cc/2c

cover – 38 to 46mm

Beam – Bc-cc/3c

34 to 44mm

Slab – Bc-Cc/3c-5c

23 to 32mm

| | | |
|---|---|---|
| 32 | 34 | 34 |
| 32 | 34 | 32 |
| 30 | 32 | 34 |

RHT.

The Measurements on this page were taken on 08/2

59

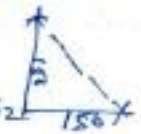
16th Floor

07/02/2023

C-1602

Column – Cc/2c (150x150)

Semidirict




+61 +60 +64 +62

Beam – Bc-Cc/3c (240)

+67 +70 +71+

Slab – Bc-cc/1c-2c (300)

+56 +54 +53 +55

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 36 | 34 | 32 |
| 34 | 36 | 32 |

Proforma

Column – Cc/3c

32 to 43mm

Beam – ~~Kc/10c-11c~~ Cc-Bc 3c-2c

40 to 50mm

Slab – Ac-Bc/~~1c-2c~~ 12c-3c

23 to 33mm

Beam – Jc-Kc/9c

34 to 42mm

Slab – Lc-Kc/5c-8c

26 to 32mm.

Rasiped Test

→ 58 65; 61 67

Slab – Bc-Ac/3c-6c

70 78 69 67

Beam Ac-Bc/3c

58 64 61 60.

UPVT

Beam – Cc/9c (260)

+69 +66 +68

Beam – Jc-Kc/9c (240)

+71 +70 +71 +69

Beam – Ec/9c-10c (290)

+71,+68 +70 +72

Slab – Lc-Kc/5c-8c

| | | |
|---|---|---|
| 36 | 38 | 40 |
| 38 | 36 | 34 |
| 36 | 40 | 48 |

The measurements on this page were taken on ..... 07/02/2023

60

17th Floor

07-02-2023

C-1701

Column – Cc/10c

(Semidirict)

+45 +43 +40 +41

Beam – Bc-Cc/10c (260)

+55 +84 +86 +88

Slab – Ac-Bc/11c-12c (300)

(Indirict)

+58 +56 +54 +52

| | | |
|---|---|---|
| 38 | 38 | 42 |
| 40 | 36 | 38 |
| 40 | 38 | 40 |

RHT

Proforma

Column – Ac/12c

38 to 48mm.

Beam – Bc/10c-11c

34 to 43mm

Slab – Ac-Bc/10c-11c

25 to 34mm.

Beam – Kc/2c-3c

34 to 42mm

Slab – Jc-Kc/3c-4c

24 to 33mm

Rasiped Test

→ 64 68 76 79

Slab Bc-Cc/11c-12c

42 48 54 50

| | | |
|---|---|---|
| 40 | 38 | 36 |
| 34 | 32 | 34 |
| 38 | 36 | 40 |

RHT

Beam – Hc/11c-12c (260)

+65 +64 +66

The measurements on this page were taken on ..... 07/02/2023

61

19th Floor

08/02/2023

:C-1904

Column-~~Kc~~ ~~Lc~~ ~~Mc~~ Kc/10c (Semidirect)

+ 34 + 42 + 44 + 40

Beam — Lc/10c (260)

+80 + 84 + 82 + 81

Slab — Lc-~~Mc~~c/11c-12c

+~~74~~ + 70 + 72 + 68

| | | |
|---|---|---|
| 40 | 44 | 42 |
| 44 | 42 | 40 |
| 42 | 40 | 44 |

RHT

Progometer

Column — Mc/11c

34 to 42mm.

Beam — Lc/11c-12c

32 to 39mm

Slab — Mc-Lc/11c-12c

24 to 31mm

Rasipad Test

→ 59 53 49 55

Slab - Mc-Lc/10c-11c

43 50 54 48

UPVT

Beam — Dc-Dc/9c (230)

+73 + 76 + 78

Beam — Ec/3c-4c (230)

+54 + 60 + 64

Progometer

Beam — Jc-Kc/9c

~~+73 + 76 + 78~~

~~Slab~~ — 33 to 42 mm

Slab — Kc-Lc/5c-8c

23 to 32 mm

A/

63

21st Floor

08/2/2023

#C-2101

Column — Cc/11c (150x150)

(Semi direct)

+ 75 + 73 + 71 + 72

Beam — Bc-Cc/10c (260mm)

+ 73 + 80 + 74 + 71

Slab — Bc-Cc/8c-10c (300)

+ 70 + 74 + 69 + 72

| | | |
|---|---|---|
| 36 | 32 | 34 |
| 34 | 38 | 38 |
| 32 | 34 | 36 |

RHT

Progometer

Column — Cc/11c

40 to 46mm

Beam — Bc/10c-11c

38 to 44mm.

Slab — Ac-Bc/11c-12c

28 to 30mm.

Rasipad Test

Slab. Ac-Bc/9c-10c

→ 64 66 69 61

A

63

20th Floor

= C - 2003

Column - MC/2C (100x100)

(Semidirect)

+43 +40 +47 +42

Beam - MC-LC/2C (300)

Indirect

+80 +84 +82 +81

Slab - LC-KC/1C-2C (300)

+70 +66 +70 +

| | | |
|---|---|---|
| 32 | 34 | 36 |
| 36 | 32 | 34 |
| 34 | 36 | 34 |

RHT-

Profometer

Column - MC/3C

30 to 40mm.

Beam - LC-KC/3C

32 to 41mm.

Slab - ~~MC-LC/2C~~

LC-KC/3C-4C

24 to 30mm

Rasiped Test

Slab - MC-LC/1C-2C

67 60 61 64

→ 70 74 68 66

Slab - BC-CC/5C-8C

| | | |
|---|---|---|
| 36 | 38 | 40 |
| 40 | 36 | 40 |
| 36 | 34 | 36 |

RHT



Tower - 'C'

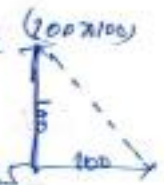
21st Floor

08/02/2023

## C-2102

Column - CC/3C (100x100)

(Semidirect)




+32 +34 +36 +35

Beam - CC/2C-3C (250)

+75 +77 +80 +73

Slab - AC-BC/3C-2C (300)

(Indirect)

+70 +71 +74 +72

| | | |
|---|---|---|
| 38 | 36 | 42 |
| 40 | 38 | 40 |
| 36 | 38 | 40 |

RHT

Profometer

Column - AC/2C

41 to 49mm.

Beam - BC-CC/3C

36 to 42 mm

Slab - BC-CC/3C-4C

22 to 28 mm

Rasiped Test

→ 70 64 69 58

Slab - AC-BC/2C-3C

39 44 48 52

UPVT

Beam - JC-KC/9C (230)

+73 +69 +72

Beam - EC/3C-4C (230)

+61 +60 +58+

## 21st Floor

: C-2103

Column – Mc/2c (100x100)

(Semidirect)

+45 + 50 + 41 + 43

Beam – Kc/2c-3c (26-M)

+82 + 85 + 80 + 84

Slab – Lc-Kc/1c-2c (30)

+74 +76 +78 +70

| | | |
|---|---|---|
| 36 | 40 | 38 |
| 40 | 38 | 42 |
| 42 | 42 | 40 |

RHT.

Profometer

Column – Mc/2c

42 to 48 mm

Beam – Lc/2c-3c

34 to 40mm.

Slab – Mc-Lc/2c-3c

23 to 31 mm

Rebiod Test

Slab – Mc-Kc/1c-2c

71 76 74 69

Column – Kc/3c

66 68 69 72

Cover

Beam – Cc-Dc/9c

31 to 40mm.

Slab – Cc-Dc/6c-9c

24 to 30 mm.

Slab – Bc-cc/2c-3c

| | | |
|---|---|---|
| 32 | 36 | 34 |
| 38 | 34 | 32 |
| 34 | 36 | 34 |

RHT



08/02/2023

## 15th Floor

#C-1501

Column – Cc/10c (100x100)

(Semidirect)

+38 +34 +33 +30

Beam – Bc-10c-11c (26c)

+84 +90 +85 +88

Slab – Bc-cc/11c-12c

(Indirect)

+30 +70 +73 +65

| | | |
|---|---|---|
| 42 | 36 | 44 |
| 38 | 40 | 38 |
| 36 | 34 | 42 |

RHT

Profometer

Column – Cc/10c

44 to 52 mm

Beam – Bc-cc/11c

37 to 44mm

Slab – Ac-Bc/11c-12c

23 to 29mm

Rebiod Test

Slab Ac-Bc/10c-11c

49 56 52 54

→ 63 68 65 61

14th Floor

C-1404

Column – Mc/11c (100x100)
(Semidirect)

+46 +43 +40 +41

Beam – Kc/10c-11c (A-260)

+90 +86 +84 +89

Slab – Mc-Lc/10c-11c (300)
(Semidirect)

+61 +78 +65 +67

| | | |
|---|---|---|
| 34 | 36 | 42 |
| 42 | 38 | 34 |
| 40 | 38 | 44 |

RHT

Proformeter

Column – Mc/11c

35 to 44mm

Beam – Lc/10c-11c

32 to 40mm

Slab – Kc-Hc/10c-11c

23 to 28mm

Rasipod Test

Slab.

→ 60 64 58 56

Slab – Lc-Kc/9c-10c

48 53 56 51



22nd Floor

08/02/2023

HC-2202

Column – Cc/2c (150x150)
(Semidirect)

+50 +56 +54 +51

Beam – Bc-Cc/3c (260)

+81 +80 +82 +78

Slab – Ac-Bc/1c-2c (300)

+64 +63 +60 +61

| | | |
|---|---|---|
| 46 | 44 | 48 |
| 48 | 44 | 46 |
| 44 | 42 | 44 |

RHT.

Proformeter

Column – Cc/2c

40 to 50mm

Beam – Bc/1c-2c

35 to 45mm.

Slab – Bc-Ac/1c-2c

22 to 32mm.

Rasipod Test

→ 67 72 75 69

Slab – Ac-Bc/2c-3c

49 56 51 54

Proformeter

Beam – Dc-Cc/4c

34 to 40mm.

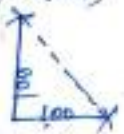
Slab. Gc-Fc/9c-10c

23 to 30mm.

22nd Floor 08/02/2023

C-2201

Column – Cc/10c (100x100)
(Semidirict)




+51 +45 +44 +42

Beam – Bc-cc/10c (Pl-260)

+90 +84 +86 +80

Slab – Bc-cc/11c-12c (30m)

+73 +70 +71 +68

| | | |
|---|---|---|
| 34 | 38 | 36 |
| 38 | 36 | 34 |
| 36 | 38 | 40 |

RHT

Proformer

Column – Cc/10c

38 to 46mm

Beam – Ac/11c

32 to 37mm

Slab – Bc-cc/11c-10c

24 to 31mm.

Revised Test

Slab – Ac-Bc/11c-12c

70 78 74 80

→ 67 70 65 69

UPVT

Beam – Hc/3c-4c (230)

+67 +65 +62

Beam – Kc-Jc/4c (230)

+63 +65 +61

Slab. Lc-Kc/8c-6c

| | | |
|---|---|---|
| 34 | 36 | 32 |
| 36 | 34 | 36 |
| 32 | 36 | 34 |

BV 70

23rd Floor 08/2/2023

# C-2304

Column – Kc/11c (150x150)
(Semidirict)

+54 +50 +53+51

Beam – Kc/10c-11c (260)

+73 +70 +7172

Slab – Lc-Mc/8c-12c

+69 +69 +60 +64

| | | |
|---|---|---|
| 42 | 36 | 38 |
| 40 | 38 | 34 |
| 42 | 44 | 38 |

RHT

Proformer

Column – Mc/11c

37 to 46mm

Beam – Lc/9c-10c

30 to 40mm

Slab – Kc-Lc/8c-10c

Beam – Dc-Cc/6c

28 to 36mm.

Slab – Gc-Fc/3c-4c

24 to 30mm.

Revised Test

Slab – Lc-Mc/11c-12c

68 74 76 72

→ 58 67 69 73

UPVT

Beam – Kc-Jc/9c

+69 +65 +67 +68

Beam – Ec/3c-4c (230)

+63 +67 +65 +62

Slab – Cc-Dc/6c-8c

| | | |
|---|---|---|
| 36 | 38 | 40 |
| 34 | 32 | 36 |
| 34 | 37 | 38 |

Q 71

Tower-'C' 24th Floor 08/02/2022

EC2402

Column — Cc/3c (100x100)
(Semidirect)

+42 +44 +48 +46

Beam — Cc/2c-3c (300) → 56 59 61 63

+90 +89 +84 +85

Slab — Bc-Cc/2c-3c (300)

+58 +56 +52 +58

| | | |
|---|---|---|
| 40 | 38 | 42 |
| 42 | 36 | 38 |
| 42 | 40 | 42 |

RHT

Profometer

Column — Cc/2c

Beam — Bc/3c-5c

Slab — Bc-Cc/2c-3c

Rasiped Test

Slab. Bc-Cc/3c-5c

60 64 73 74

UPVT

Beam Dc-Cc/9c

+65 +60 +64 +63

Slab. Cc-Bc/10c-9c

| | | |
|---|---|---|
| 38 | 36 | 40 |
| 42 | 44 | 42 |
| 34 | 40 | 36 |

Beam. HC/3c-4c

+71 +68 +72 +72

Q/ (72)

24th Floor 08/02/2023

C# 2401

Column — Ac/11c (100x100)
(Semidirect)

+37 +38 +39 +40

Beam — Cc/10c-11c (260)

+80 +84 +81 +83

Slab — Ac-Bc/10c-11c

+57 +56 +59 +60

| | | |
|---|---|---|
| 40 | 42 | 46 |
| 42 | 46 | 44 |
| 40 | 42 | 44 |

RHT.

Profometer.

Column — Ac/11c

40 to 50mm

Beam — Bc/11c-12c

35 to 46mm

Slab — Bc-Cc/11c-12c.

Rasiped Test

Slab — Ac-Bc/11c-12c

78, 74 73 75

→ 70 68 78 74

Profometer

Beam Jc-Kc/9c

34 to 40mm

Slab — Jc-Kc/5c-9c

24 to 30mm

Q/ (73)

Tower - 'C' - 26th Floor 09/02/2023

C-2601

Column - Ac/11c (100x100) (Semidirect)

+45 +40 +42 +43

Beam - BC-CC/11C (260)

+84 +80 +82 +86

Slab - BC-AC/11C-12C (300)

+80 +84 +80 +86

74 70 72 73

Rasiped

→ 50 54 48 59

Slab - Ac-Bc/8c-10c

72 76 70 67

| | | |
|---|---|---|
| 38 | 40 | 36 |
| 38 | 42 | 42 |
| 36 | 42 | 38 |

RHT

Proformer

Column - Cc/10c

36 to 42 mm.

Beam - Bc-cc/10c

32 to 40 mm.

Slab - Bc-Cc/10c-11c

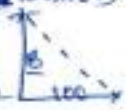
28 to 31 mm.



Tower - 'C' - 26th Floor 09-02-2023

#C 2602

Column - Ac/2c (100x100) (Semidirect)




+30 +28 +34 +32

Beam - Bc/2c-3c (260)

+72 +74 +70 +71

Slab - Ac-Bc/1c-2c (300)

+60 +65 +67 +68

| | | |
|---|---|---|
| 36 | 38 | 34 |
| 38 | 34 | 36 |
| 34 | 36 | 38 |

RHT

Proformer

Column - Cc/2c

36 to 45 mm

Beam - Bc/3c-5c

30 to 38 mm

Slab - Bc-cc/3c-5c

23 to 30 mm

Rasiped Test

Slab - Ac-Bc/2c-3c

91 87 94 89

→ 70 76 79 83

Tower 'C' - 26th Floor 09-02-2023

'C-2603

Column - KC/3C (100X100)
(Semidirect)

+44 +43+42+40 → 79 84 82 86

Beam - LC/2C-3C (260)

+84 +88+83+81

Slab - MC-LC/2C-3C (300)

+64 +60 +66 +67.

| | | |
|---|---|---|
| 38 | 36 | 34 |
| 36 | 38 | 36 |
| 38 | 36 | 32 |

RHT

Proformeter

Column - LC/2C

35 to 42mm.

Beam - MC-LC/2C

30 to 40mm

Slab - MC-LC/1C-2C

Rasipad Test

Slab - MC-KC/1C-2C

UPVT Proformeter

Beam - CC-DC/9C

34 to 40mm.

Slab Beam BC-CC/6C-9C

24 to 30mm.

Slab KC-LC/5C-9C

| | | |
|---|---|---|
| 30 | 34 | 32 |
| 34 | 32 | 30 |
| 32 | 30 | 34. |

RHT



TOWER-C 26th floor 09/2/2023

#2604

Column KC/11C (150X150)
(Semidirect)

+61 +62+58+59

Beam - KC/11C-12C (260) → 84 80 82 77

+76 +74+72+70

Slab - KC-LC/11C-12C (300)

+70 +74+72+76.

| | | |
|---|---|---|
| 38 | 32 | 34 |
| 34 | 38 | 36 |
| 32 | 38 | 36 |

RHT

Proformeter

Column - KC/11C

30 to 38mm

Beam - 11C/2C-MC

34 to 40mm

Slab - MC-KC/11C-12C

22 to 28mm

Rasipad.

Slab - LC-MC/10C-11C

78 76 80 74.

UPVT

Beam - KC-JC/4C (230)

+60 + 58 + 57

Beam - MC/3C-4C (230)

+69 + 70 +67.

Slab - BC-CC/5C-9C

| | | |
|---|---|---|
| 32 | 34 | 30 |
| 36 | 30 | 34 |
| 34 | 32 | 30 |

RHT

Tower 'C' 10th Floor, 09-02-2023

C-1002

Column - CC/2C (150x150)
(Semidirect)

+60 +58 +59 +62

Rapid Test

Slab. AC-BC/2C-3C

76 72 80 78

Beam - AC-BC/2C (300) → 81 78 83 75

+76 +75 +73 +74

Slab - BC-AC/3C-5C (300)

+65 +69 +70 +71

| | | |
|---|---|---|
| 38 | 36 | 40 |
| 38 | 42 | 40 |
| 34 | 36 | 40 |

Profometer

column - CC/2C

35 to 44 mm

Beam - BC/3C-6C

38 to 39 mm

Slab - BC-CC/3C-5C

25 to 30mm.



Tower 'C' 25th Floor 09-02-2023

# C-2502

Column - AC/2C
(Semidirect)

(100x100)

+ + + +

Rapid Test

→ 78 72 81 84

Beam - BC-CC/3C

+75 +80 +81 +77

Slab - AC-BC/1C-2C

68 72 76 79

Slab - BC-CC/1C-2C

+76 +70 +71 +74

| | | |
|---|---|---|
| 36 | 36 | 34 |
| 38 | 34 | 32 |
| 38 | 40 | 36 |

Profometer

Column - CC/2C

30 to 42mm

Beam - CC/1C-2C

28 to 40mm

Slab - BC-CC/1C-2C

24 to 30mm

Tower-'C' 20th Floor 10-02-2025

C-2001

Column - Ac/11c (100x100)
(Semidirect)

+40 +48 +50+

Beam - Bc/10c-11c (26)

+82 +80 +84 +73

Slab - ~~Cc~~ cc - Bc/10c-11c (300)

+66 +64+62+63

| | | |
|---|---|---|
| 38 | 40 | 36 |
| 40 | 36 | 40 |
| 36 | 38 | 40 |

RHT

Profometer

Column - Cc/10c

30 to 37 mm

Beam - Ac-Bc/11c

35 to 40 mm

Slab - Ac-Bc/11c-10c

24 to 29 mm.

Rasiped Test

→ 78 74 70 76

Slab - Cc-Bc/8c-10c

54 52 50 48

UPVT

Beam - Kc-Jc/4c (230)

+69 +65 +63+67

Beam - ~~Hc/3c-4c~~ Dc-cc/4c (230)

+70 +68 +74

Profometer

Slab - Kc-Lc/5c-8c

23 to 30 mm

Beam - Jc-Kc/4c

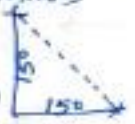
33 to 42 mm.

80

Tower-'c' 25th Floor 10-02-2023

# C-2501

Column - Cc/11c (150x150)
(Semidirect)




+50 +53+55+51

Beam - Bc-cc/10c

+80 +71 +73+65

Slab - Ec-Dc/cc/10c-9c-10c (300)

+63 +70 +71 +64

| | | |
|---|---|---|
| 30 | 34 | 36 |
| 28 | 32 | 34 |
| 36 | 36 | 30 |

RHT

Profometer

Column - Ac/12c

37 to 42 mm

Beam - Ac-Bc/11c

35 to 42 mm

Slab - Bc-cc/11c-12c

24 to 30 mm

Rasiped Test

Slab - Ac-Bc/10c-11c

58 59 49 55

→ 73 80 76 78

81

Tower-C 25th floor 10/02/2023

C-2503

Column - Kc/2c (150x150)

(Semidirect)

+63 +66 +61 +65

Beam — Mc-Lc/2c-3c(260)

+80 +76 +78 +83

Slab - Mc-Lc/1c-2c(300)

+58 +66 +63 +60

| | | |
|---|---|---|
| 38 | 32 | 40 |
| 36 | 34 | 38 |
| 40 | 36 | 38 |

RHT

Proformeter

Column - Mc/2c

34 to 40mm

Beam - Lc-Kc/3c

30 to 48mm

Slab - Hc-Kc/2c-3c

22 to 26mm.

Rasipod Test.

→ 84 80 77 86

Slab - Lc-Mc/3c-5c

69 63 68 65



Tower-C 8th floor 10-02-2023

# C-8003

Column - Kc/2c (150x150)

(Semidirect)

+54 +60 +55 +51

Beam - Lc-Kc/3c(260)

+63 +60 +64 +66

Slab - Mc-Lc/1c-2c

+72 +70 +58 +65 (300)

| | | |
|---|---|---|
| 38 | 36 | 40 |
| 32 | 38 | 40 |
| 38 | 36 | 38 |

Profometer

Column - Kc/3c

36 to 41 mm.

Beam - Kc-Lc/2c

33 to 40mm

Slab - Lc-Mc/2c-3c

25 to 30 mm.

~~Half cell~~

Slab-Hc-Kc/2c-3c

| | | |
|---|---|---|
| 32 | 36 | 34 |
| 32 | 34 | 30 |
| 30 | 32 | 34 |

RHT.

Rasipod Test

Slab - Hc-Kc/2c-3c

18 24 22 20

Column - Mc/2c

68 74 71 69

Tower-C 16th Floor 10-02-2023

C-1604

Column – Kc/11c (Semidirect)

+45 +46 +40 +41

Beam-Kc-Lc/9c (250)

+64 +60 +61 +62

Slab – Mc-Lc/11c-12c (300)

+80 +81 +76 +73

Slab – Ec-Hc/11c-12c

| | | |
|---|---|---|
| 34 | 36 | 38 |
| 34 | 40 | 36 |
| 38 | 36 | 34 |

Profometer

column – 10 kc

22 to 42 mm

Beam – Kc-Lc/10c

33 to 38 mm

Slab – Kc-Hc/11c-12c

24 to 30 mm

Rapid Test

→ 84 76 73 80

Slab – Lc-Mc/10c-11c

34 42 48 35

UPVT

Beam – Lc/11c-12c (250)

+60 +64 +68 +63

column – Lc/11c (P/-660)

+180, +176 +170 +171



Tower-C 23rd Floor 10-02-2023

#C-2301

Column – Cc/11c (150x150) (Semidirect)

+60 +64 +66 +58

Beam – Cc/10c-11c (260)

+80 +73 +77 +75

Slab – Ac-Bc/11c-12c

+71 +68 +70 +73

| | | |
|---|---|---|
| 42 | 44 | 40 |
| 38 | 42 | 38 |
| 38 | 40 | 42 |

RHT

Profometer

Column – Ac/11c

38 to 48 mm

Beam – Bc-cc/10c

31 to 40 mm

Slab – Bc-cc/9c-10c

23 to 29 mm

Rapid Test

→ 80. 76 74 70

Slab Bc-Ac/11c-12c

40 44 44 49

Slab – Ec-cc/10c-11c

| | | |
|---|---|---|
| 40 | 38 | 36 |
| 42 | 38 | 40 |
| 38 | 40 | 42 |

RHT

Tower – C 24th Floor 10-02-2023

# C-2404

Column – Mc/11c (100x100)
(Semidirict)

+42 + 46 +44+43

Beam – Kc-Lc/11c (26)

+ 78 + 75 + 80 + 75

Slab – Lc-Mc / 8c-10c (300)

+ 56 + 54 + 53 + 51

Slab – Lc-Kc/11c-12c

| | | |
|---|---|---|
| 36 | 40 | 38 |
| 40 | 36 | 42 |
| 38 | 42 | 40 |

RHT-

Profometer

Column – Mc/11c

33 to 44 mm.

Beam – Lc-Kc/12c

30 to 40mm.

Slab – Lc-Kc/11c-12c

24 to 30 mm

Slab – Mc-Kc/11c-12c

| | | |
|---|---|---|
| 34 | 36 | 32 |
| 34 | 32 | 34 |
| 36 | 34 | 32 |



Tower-C – 25th Floor 10-02-2023

# C-2504

Column – Mc/11c (100x100)
(Semidirict)

+37 + 40 +41 +38

Beam – Lc-Kc/10c

+ 57 +61 +64 +62

Slab – Mc-Kc/11c-12c

+ 60 + 67 +63 +

Slab. Mc-Kc/11c-12c

| | | |
|---|---|---|
| 30 | 32 | 34 |
| 36 | 38 | 36 |
| 34 | 36 | 34 |

Profometer

column – Kc/11c

38 to 48 mm

Beam – Lc/10c-11c

34 to 39 mm

Slab – Lc-Kc/9c-10c

24 to 30mm.

UPVT

Beam – 6 CC-Dc/9c (230)

+ 65 + 63 + 62

Beam – Ec/Ac-3c (230)

+74 + 70 + 71

Slab Kc-Lc/11c-12c

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 34 | 36 | 32 |
| 36 | 34 | 36 |

Profometer

Beam – Kc-Jc/9c

34 to 38 mm

Slab – Lc-Kc / 5c-8c

24 to 29 mm.

Slab – Bc-Cc/6c-8c

| | | |
|---|---|---|
| 34 | 30 | 32 |
| 36 | 32 | 34 |
| 32 | 34 | 34. |

RHT

Tower - 'c' 14th Floor 11-02-2023

FC - 1401

column AC/11C

(Semidirect)

+35 +39 +40 +41

Beam — CC/10C - 11C (270)

+85 +83 +80 +82

Slab — BC-CC/10C-11C (300)

+63 +60 +65 +60

Slab - EC-CC/10C-11C

| | | |
|---|---|---|
| 30 | 34 | 34 |
| 32 | 32 | 30 |
| 34 | 30 | 32 |

RHT

Proformeter

column — CC/10C

35-44 mm

Beam - BC/10C-11C

32 to 40 mm

Slab — BC-AC/10C-11C

22 to 30 mm

Rasiped Test

Slab — AC-BC/9C-10C

54 48 57 59

column - CC/11C

74 78 80 84



Tower - 'c' 24th Floor 11-02-2023

# C-2403

Column — KC/2C (150x160)

(Semidirect)

+58 +61 +63 +56

Beam — KC/1C-2C

+62 +60 +61 +63

Slab — 2C-KC/3C-5C

+74 +71 +67 +72

Slab — HC-KC/2C-3C

| | | |
|---|---|---|
| 42 | 44 | 40 |
| 42 | 38 | 42 |
| 44 | 40 | 40 |

RHT

Proformeter

Column - KC/3C

35 to 42 mm

Beam — MC-LC/3C

31 to 40mm

Slab — MC-LC/1C-2C

22 to 30 mm

Rasipod Test

column - MC/2C

76 80 74 73

Slab MC-LC-2C-3C

56 60 54 59

UPVT

Beam — CC-DC/9C (230)

+65 +66 +63

Beam — EC/1C-2C (230)

+70 +72 +68

Slab — FC-GC/10C

| | | |
|---|---|---|
| 34 | 32 | 30 |
| 32 | 34 | 30 |
| 30 | 32 | 34 |

RHT

Proformeter

Beam — HC/3C-4C

24 to 32mm

Slab — BC-CC/6C-8C

23 to 30mm

Tower 'C' - 22nd floor 11-02-2023

F.C-2203

Column-KC/2C (150x150)

(Semidirect)

+52 +65 +60+63

Beam — 2C-KC/3C (260)

+69 +64+67+65

Slab — MC-2C/1C-2C

+71 +74+75+73

Slab-2C-KC/2C-3C

| | | |
|---|---|---|
| 34 | 32 | 30 |
| 36 | 34 | 32 |
| 30 | 32 | 30 |

RHT

Proformetry

Column-MC/2C

34 to 43 mm

Beam — MC-2C/1C-2C

32 to column

Slab — 1C-KC/1C-2C

24 to 30 mm

Rasiped Test

Slab: MC-2C/1C-2C

64 66 57 55

Column-KC/3C

70 80 76 73



18th Floor 11-02-2023

Common area.

Beam — EC/3C-4C

+84 +80 +82+

Slab — EC-DC/9C-3C

(300)

+70 +73 +71+

Beam — KC-JC/4C (230.

+75 + 74 +73+

Slab-BC-CC/6C-9C

| | | |
|---|---|---|
| 32 | 30 | 32 |
| 30 | 28 | 30 |
| 32 | 28 | 30 |

RHT.

Slab-KC-2C/6C-8C

| | | |
|---|---|---|
| 28 | 32 | 30 |
| 30 | 28 | 32 |
| 28 | 30 | 30 |

Proformetry

Beam — KC/3C

34 to 42 mm

Slab — 1G-FC/3C-4C

25 to 32 mm.

18th Floor

11-02-2023

C-1801

Columan - Cc/11c (150x150)

(Semidirct)

+76 + 72 + 74 + 78

Beam — Cc/10c-11c (260)

+80 +78 +81 +83

Slab — Cc-Bc/9c-10c (300)

+54 +57 +60 +61

Slab — Ac-Bc/10c-11c

| | | |
|---|---|---|
| 34 | 32 | 30 |
| 36 | 34 | 36 |
| 38 | 34 | 36 |

RHT

Profometer

Column — Ac/11c

84 to 46 mm

Beam — Ac/10c-9c

31 to 42 mm.

Slab — Ec-cc/10c-11c

24 to 32 mm.

Rasipad

Slab — Ac-Bc/11c 12c

82, 86 82 80.

Beam — Cc/10c-11c

79 78 70 72

Column — Bc-11c

68 62 64 63

Slab Bc-cc 11c-12c

| | | |
|---|---|---|
| 32 | 34 | 31 |
| 30 | 34 | 32 |
| 34 | 32 | 34 |

13th Floor

C-1303

Column - Mc/2c (100x100)

(Semidirct)

+30 + 32 + 31 + 30

Beam - Lc-Kc/2c (260)

+80 + 78 + 81 + 80

Slab - Kc-Lc/1c-2c (300)

+70 + 76 + 80 + 74

Slab - Kc-Hc/2c-3c

| | | |
|---|---|---|
| 28 | 30 | 30 |
| 32 | 28 | 32 |
| 30 | 32 | 30 |

RHT

Profometer

Column - Hc/2c

45 to 55 mm.

Beam — Lc-Kc/3c

32 to 42 mm.

Slab — Mc-Lc/2c-3c

25 to 30 mm

13-02-2023

Slab - Lc-Mc/1c-2c

| | | |
|---|---|---|
| 32 | 30 | 28 |
| 28 | 28 | 30 |
| 30 | 32 | 30 |

RHT

Slab - Hc-Kc/2c

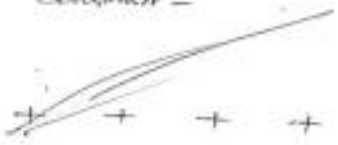
| | | |
|---|---|---|
| 30 | 30 | 32 |
| 30 | 32 | 34 |
| 34 | 32 | 34 |

1st Floor

13-2-2023

: C - 0101

Column –



Beam – Kc/2c-3c (25B)

+64 +682 +69 +70

Slab – 2C-Kc/1c·2c (30m)
(Indirect)

+80 +77 +70 +71

Slab - Ac-Bc/10c-11c

| | | |
|---|---|---|
| 30 | 48 | 40 |
| 38 | 42 | 40 |
| 42 | 38 | 40 |

RHT

Peripheries

column- Mc/2c

46 to 55 mm.

Beam – Mc-2c/2c-3c

42 to 50m.

Slab – 2c-Kc/3c-2c

30 to 38 mm

Slab Bc-cc/11c-12c

| | | |
|---|---|---|
| 40 | 34 | 36 |
| 35 | 42 | 38 |
| 38 | 40 | 40 |

RHT

+ 59 +
+ 63 +
+ 61 +
+ 55 +
+ 66 +
+ 53 +
+ 150 + DB.

column-Bc/10c
(100x150)

Semi direct

94

#0101

1st Floor.

13-02-2023

Column Ac/11c (300)
(Indirect)

+ 97 + 88 +
+ 112 + 87 +
DB + 134 + 85 +
DB + 112 + 93 +
+ 84 + 90 +
+ 99 + 86 +
DB + 134 + 85 +

Cracks.

Column - Cc/11c (300)

+ 86 + 84 +
+ 88 + 87 +
+ 82 + 87 +
+ 77 + 84 +
+ DB + DB +

Indirect

95

Blanks

Halfy Cell – #8003

Slab – Hc-Kc/2c-3c

13th to 14th Floor Staircase ~~Slab~~ 4Hc-6c/10c-11c

~~Halfy Cell~~

9995969957 65 – Blanks

5000
440
400
515.1
1040
504
440
1050
651
426
3100
659
163
1040
599
666
2640
549.57
1284
599
357
1010
246
625
27083

509
40
549
9113

5316.57

17044.18

21574.06

4530.78

06/02/2023

Floor. 13th Floor.

Flat NO - 1304

Beam -> 10b-11b / Kb-Lb

Cover - 23 - 60mm

+78 +80 +87 +90 +92

PL = 270 mm

Column - 10b / Kb

| | |
|---|---|
| +91 | +92 |
| +87 | +92 |
| +90 | +86 |

Indirect

PL = 300mm

Column - 11b / Kb (Semidirect)

| |
|---|
| +74 |
| +76 |
| +73 |
| +82 |
| +76 |

Semidirect

slab = Kb-Lb / 10b-11b

Cover = 31 - 65mm

| | | |
|---|---|---|
| 36 | 34 | 38 |
| 38 | 40 | 32 |
| 36 | 38 | 42 |

RHT

Slab = 11b-12b / Nb-Lb

Cover = 36 - 44mm

| | | |
|---|---|---|
| 38 | 40 | 38 |
| 38 | 42 | 42 |
| 42 | 40 | 38 |

Beam = 11b-12b / Nb

Cover = 48-54mm

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The Measurements on this page were taken on ..... 06/02/23

06/02/2023

# Tower - B 15th Floor

Flat NO - (1502)

Beam → Cb/2b-3b

Cover → 32-68 mm

+93 +91 +88 +95 +86

PL = 280 mm

Slab → 3b-2b/Bb-Cb

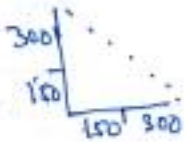
Cover → 37 ÷ 49 mm

| | | |
|---|---|---|
| 30 | 32 | 30 |
| 32 | 30 | 32 |
| 34 | 30 | 32 |

RHT

Column → 2b/Bb (Semidirect)

+61 + 185
+72 + 190
+73 + 186




Slab → Bb-Cb/Ab-2b

Cover = 32 - 44 mm

| | | |
|---|---|---|
| 28 | 30 | 32 |
| 30 | 32 | 30 |
| 32 | 30 | 32 |

RHT

Column → 2b/Ab (Indirect)

PL = 200 mm

+63 + 67
+65 + 64
+62 + 70
+60 + 61
+63 + 66

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06/02/2023

# Tower B 15th Floor Common Area

Column → 9b - 11b/Gb-Hb

Semi direct

+ 66
+ 58
+ 67
+ 60

Column → 9b-11b/Eb-Fb

Indirect

| | | | |
|---|---|---|---|
| +86 | + 86 | +84 | + 83 |
| +98 | + 96 | +94 | +94 |
| + 96 | + 96 | + 98 | + 98 |
| +98 | + 96 | + 99 | + 100 |

PL: 300

Cover = 68 - 68 mm

Column → 4b - 2b/Eb-Fb

| | | | |
|---|---|---|---|
| +94 | +91 | +98 | +98 |
| +98 | +97 | +98 | +95 |
| +98 | +96 | +96 | +92 |
| +98 | +90 | +86 | +98 |
| +90 | +90 | +81 | +86 |

PL: 300

Column → 4b-2b/Hb-Gb

Cover = 80 - 100 mm

| | | | |
|---|---|---|---|
| + 100 | +101 | +102 | + 99 |
| + 99 | + 98 | + 95 | + 99 |
| + 96 | + 100 | + 105 | + 106 |
| + 110 | + 112 | + 118 | + 122 |
| + 118 | + 110 | + 104 | + 126 |

PL = 300

Slab → Jb-Hb/Gb-3b

Cover = 34 - 42 mm

| | | |
|---|---|---|
| 28 | 32 | 30 |
| 30 | 32 | 32 |
| 28 | 30 | 28 |

Slab = Jb-Hb/Gb-3b

+88 + 83
+82 + 75
+75 + 71

~~+82 + 78~~

PL = 300 mm

+72
+78

After Re... wiy Plast...

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06/02/2023

Beam → 4b/Db - Cb (Direct)

+59 +59 +63 +66 +61

PL = 230

Slab → Eb/ab - 5b/6b / Cb - Bb (Indirect)

| | |
|---|---|
| +69 | +72 |
| +65 | +76 |
| +74 | +86 |

PL = 300 mm

Tower (B) 16th Floor. Common Area

eam → 8b-9b / Jb-Kb (Direct)

+57 +61 +58 +60 +58

PL = 230 mm

Slab = 5b-8b / Kb-2b (Indirect)

| | |
|---|---|
| +70 | +83 |
| +72 | +61 |
| +66 | +80 |

PL = 300 mm

lumn → 9b-11b / Fb-Eb

Semi direct

+72
+68
+65
+64
+63

150 | 150

Column → 9b-11b / Hb-Gb

PL = 300 mm

| | | | |
|---|---|---|---|
| +98 | +99 | +100 | +94 |
| +99 | +98 | +95 | +100 |
| +105 | +102 | +104 | +98 |
| +98 | +100 | +102 | +107 |
| +109 | +112 | +99 | +112 |

slab - Fb-Gb / 9b-10b

Cover = 34 - 48 mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 34 | 36 | 38 |
| 38 | 32 | 34 |

RHT

The Measurements on this page were taken on ..... 06/02...

(4)

06/02/2023

Beam → 9b - 10b / Fb - Gb (Semi direct)

+42 + 46 + 50 + 52 + 52 + 60

150 | 150

Tower (B) 17th Floor Common Area

Column Fb-Gb / 9b-11b

Cover = 47 - 52 mm.

Slab - 4b - 3b / Db - Cb

Cover - 34 - 42 mm

| | | |
|---|---|---|
| 32 | 32 | 28 |
| 30 | 28 | 32 |
| 32 | 28 | 32 |

Column - Hb-Gb / 4b - 2b

SW PL = 300 mm

| | | | |
|---|---|---|---|
| +99 | +100 | +98 | +86 |
| +86 | +88 | +99 | +98 |
| +96 | +84 | +83 | +85 |
| +77 | +82 | +84 | +88 |
| +75 | +76 | +74 | +77 |

Slab - Db-Eb / 9b-10b

Cover = 37 - 42 mm

| | | |
|---|---|---|
| 32 | 32 | 34 |
| 36 | 32 | 36 |
| 38 | 34 | 38 |

RHT

Beab - 8b-9b / Cb - Db

Cover - 47 - 52 mm.

Beam → 3b-4b / Fb-Eb

PL = 240

+62 +59 +68 +64 +66

Slab → 9b-5b / Lb-Kb (Indirect)

PL = 300 mm

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 34 | 38 | 36 |
| 38 | 34 | 32 |

| | |
|---|---|
| +69 | +74 |
| +81 | +79 |
| +82 | +93 |

The Measurements on this page were taken on .....

(5)

07/02/2023

Tower B 14th Floor

Flat NO (1403)

Beam → 2b-3b / Kb

Cover = 58-62mm

85 + 77 + 78 + 79 + 88

PL = 270mm

Slab = 2b-3b / Lb-Kb

Cover = 40-48mm

| | | |
|---|---|---|
| 36 | 34 | 34 |
| 30 | 32 | 34 |
| 34 | 36 | 34 |

RHT

lumn → 2b / Mb (Indirect)

| | |
|---|---|
| 75 + 78 | PL = 250mm |
| 175 + 75 | |
| 175 + 72 | |
| 171 + 72 | |
| + 72 + 75 | |

Column → 2b / Kb

Cover = 52-84mm

column → 2b / Mb

Cover = 66-70mm

Slab → Lb-Kb / 1b-2b

Cover = 34-40mm

| | | |
|---|---|---|
| 36 | 38 | 36 |
| 34 | 32 | 32 |
| 32 | 38 | 34 |

RHT

Column - 3b / Kb (Indirect)

| | |
|---|---|
| +101 + 111 | PL = 300mm |
| +106 + 109 | |
| +106 + 102 | |
| +107 + 109 | |

The Measurements on this page were taken on .....

(6)

07/02/2023

Tower B 15th Floor

Flat NO (1503)

Beam → Kb / 2b-3b

+ 91 + 90 + 90 + 93 + 97

PL = 290mm

Slab - 3Mb-2b / 1b-2b

Cover = 39-48mm

| | | |
|---|---|---|
| 34 | 32 | 38 |
| 38 | 36 | 36 |
| 34 | 32 | 34 |

RHT

Beam - 2b / 1b-2b

Cover = 62-68mm

Slab = 4b-3b / 2b-Kb

Cover = 42-55mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 36 | 32 | 34 |
| 36 | 36 | 34 |

RHT

Column - 2b / Mb (Indirect)

| | |
|---|---|
| +83 + 82 | PL = 250mm |
| +83 + 72 | |
| + 74 + 72 | |

column - 3b / Kb (Indirect)

| | |
|---|---|
| +92 + 87 | PL = 300mm |
| +92 + 92 | |
| +93 + 88 | |

The Measurements on this page were taken on .....

(7)

07/02/2023

Flat NO = 1504

Beam → 10b - 11b/Kb (Indirect)

| +81 | +84 | +83 | +87 | +85 |
|---|---|---|---|---|

PL = 270 mm

Slab = 10b - 11b/Kb - Lb

Cover = 49 - 53 mm

| 36 | 34 | 36 |
|---|---|---|
| 32 | 32 | 36 |
| 34 | 32 | 32 |

RHT

Beam → 10b - 11b

Cover = 57 - 64 mm

Column → 10b / Kb (Indirect)

| +92 | +93 |
|---|---|
| +88 | +88 |
| +86 | +81 |

PL = 300 mm

Column → 11b / Lb (Semi direct)

| +43 | +150 |
|---|---|
| +42 | +154 |
| +43 | +151 |




Slab = 11b - 12b / Lb - Mb

Cover = 44 - 50 mm

| 34 | 32 | 38 |
|---|---|---|
| 34 | 34 | 38 |
| 38 | 32 | 36 |

RHT

The Measurements on this page were taken on 07/02/2023



07/02/2023

Flat NO 1501

Beam → Cb / 11b - 10b

| +110 | +114 | +123 | +115 | +15 |
|---|---|---|---|---|

PL = 320 mm

Slab - Bb - Cb / 11b - 12b

Cover = 46 - 50 mm

| 32 | 30 | 30 |
|---|---|---|
| 28 | 28 | 30 |
| 30 | 30 | 32 |

RHT

Column → 11b / Ab (Indirect)

| +74 | +79 |
|---|---|
| +77 | +72 |
| +72 | +76 |

PL = 250 mm

Column → 11b / Cb

Cover = 51 - 63 mm

Column → 11b / Bb

Cover = 65 - 69 mm

Column - 11b / Ab (Indirect)

Slab - 10 - 11b / Ab - Bb

Cover = 52 - 60 mm

| 32 | 32 | 34 |
|---|---|---|
| 34 | 36 | 36 |
| 34 | 36 | 32 |

RHT

Column → 10b - Cb (Indirect)

| +106 | +111 |
|---|---|
| +113 | +101 |
| +102 | +110 |

PL = 300 mm

The Measurements on this page were taken on 07/02/2023

07/02/2023

lat NO -> 1604

Beam -> 10b-11b/Kb (Indirect)

+92 +86 +87 +91 +94

DL = 280 mm

Cover = 51-84 mm

Slab = 10b-11b/Lb-Kb

Cover = 42-48 mm

| | | |
|---|---|---|
| 32 | 32 | 34 |
| 30 | 32 | 32 |
| 34 | 34 | 32 |

RHT

Beam = 11b-12b/Lb

47-58 mm

ab = 11b-12b/Kb-Lb

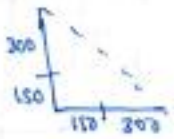
Nov = 41-48 mm

Column -> 11b/Kb (Semi direct)

+73 +248

+76 +283

+74 +235




| | | |
|---|---|---|
| 32 | 36 | 34 |
| 36 | 32 | 36 |
| 32 | 24 | 34 |

RHT

Slab -> 10b-11b/Bb-Cb

Cover = 45-53 mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 36 | 34 | 32 |
| 32 | 34 | 34 |

RHT

Flat NO - 1601

Beam -> 10b-11b/Cb (Direct)

Cover = 34-48 mm

+74 +74 +72 +72 +75

DL = 270 mm

The Measurements on this page were taken on 07/02

10

07/02/2023

Column -> 11b/Ab (Indirect)

+75

+77

+73

+75

DL = 250 mm

Column -> 10b-Cb (Indirect)

+91 +84

+100 +91

+105 +106

DL = 300 mm

Slab -> 9b-10b/Bb-Cb

Cover = 33-48 mm

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 34 | 36 | 34 |
| 32 | 36 | 36 |

RHT

Slab -> 8b-10b/Ab-Bb (Indirect)

Indirect (UPVT)

+76 +71

+76 +75

+74 +73

DL = 300 mm

Cover = 42-49 mm

The Measurements on this page were taken on 07/02

11

07/02/2023

Tower B 17th Floor

Flat → (1701)

Beam → Cb / 10b - 11b (UPVT)

+120 +135 +120 +130 +125

PL = 320 mm

Column → Nb / Cb

Cover - 42-67 mm

Beam → 11b-12b / Bb

Cover - 58-64 mm

Slab → Db Cb / 11b-12b

Cover = 35-64 mm

| | | |
|---|---|---|
| 34 | 34 | 38 |
| 36 | 34 | 32 |
| 36 | 36 | 38 |

RHT

Ab → 11b-12b / Ab-Bb

Cover = 26-53 mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 36 | 36 | 34 |
| 38 | 36 | 38 |

Column → 11b / Ab

Cover = 46-58 mm

69 +63
75 +66
+75 +65
= PL = 250 mm

Column → 11b / Cb (Semi Direct)

+82
+90
+98
+92

150
150

The Measurements on this page were taken on 07/02

12

07/02/2023

Tower (B)

17th Floor

Flat No → (1703)

Beam → Kb / 2b-3b

+88 +82 +84 +88 +89

PL = 280 mm

Slab → 3b-4b / 2b-Nb

Cover = 41-48 mm

| | | |
|---|---|---|
| 32 | 38 | 34 |
| 36 | 32 | 32 |
| 38 | 38 | 36 |

Beam → 2b / 3b-4b

Cover = 52-64 mm

Column → 8b / Nb (Indirect)

+93 +89
+88 +86
+89 +92
PL = 300 mm

Slab - 2b-3b / Nb-2b

Cover = 42-55 mm

| | | |
|---|---|---|
| 32 | 32 | 36 |
| 34 | 34 | 32 |
| 36 | 36 | 34 |

RHT

Column → 2b / 2b-3b

Cover = 55-65 mm

Column → 1b / Nb (Indirect)

+91 +94
+95 +94
+93 +92
PL = 300 mm

The Measurements on this page were taken on 07/02

13

17th Floor Tower (A) 07/02/2023

Flat NO → (1704)

Beam → Kb / 10b - 11b (Indirect)

+89 +95 +98 +96

PL = 300 mm

Cover = 38 - 68 mm

Slab → Kb - 9b / 10b - 11b

Cover = 21 - 50 mm

| | | |
|---|---|---|
| 32 | 30 | 30 |
| 28 | 28 | 32 |
| 32 | 32 | 32 |

RHT

Column - 11b / 2b (Indirect)

| | | |
|---|---|---|
| +88 | +90 | PL = 250 mm |
| +86 | +82 | |
| +80 | +89 | |

Column → 10b / Kb (Indirect)

Cover = 10b / Kb

| | | |
|---|---|---|
| +98 | +95 | PL = 300 mm |
| +94 | +90 | |
| +86 | +98 | |

Slab → 8b - 10b / 2b - Kb

Cover = 40 - 46 mm

| | | |
|---|---|---|
| 34 | 34 | 32 |
| 30 | 32 | 32 |
| 34 | 32 | 32 |

RHT

Beam → 8b - 10b / 2b

Cover = 22 - 62 mm

The Measurements on this page were taken on ...07/02/23...

(14)

07/02/2023

Tower (B) 19th Floor

Flat NO (1903)

Beam → Kb / 2b - 3b (Indirect)

+96 +89 +92 +98 +99

PL = 260 mm

Cover = 50 - 55 mm

Column → 1b / Kb

cover = 57 - 62 mm

| | | |
|---|---|---|
| +94 | +95 | PL = 300 mm |
| +80 | +99 | |
| +94 | +96 | |

Slab → 3b - 2b / Kb - 2b

cover = 59 - 73 mm

| | | |
|---|---|---|
| 34 | 34 | 36 |
| 34 | 34 | 32 |
| 36 | 34 | 36 |

RHT

Column → 3b / Kb

Cover → 69 - 75 mm

Slab → 2b - 3b / 2b - Kb

cover = 37 - 45 mm

| | | |
|---|---|---|
| 36 | 34 | 38 |
| 38 | 34 | 32 |
| 34 | 38 | 38 |

Column → 2b / 2b (Indirect)

| | | |
|---|---|---|
| +83 | +70 | PL = 250 mm. |
| +84 | +76 | |
| +78 | +80 | |

The Measurements on this page were taken on ...07/02/23...

(15)

Tower (B) 11th Floor 07/02/2023

Flat → (1104)

Beam → Kb/10b-11b (Direct)

Cover = 31 - 64 mm

+78 +84 +79 +80 +81

PL = 270 mm

Slab → 8b-10b/Mb-Lb

Cover = 45 - 55 mm

| | | |
|---|---|---|
| 32 | 32 | 28 |
| 32 | 28 | 30 |
| 30 | 32 | 32 |

RHT

Column → 11b/Kb (Semi direct)

+64
+67
+68
+72
+78

150 × 150

Column → 11b/Kb

Cover = 53 - 68 mm

Slab → Lb-Kb/10b-11b

Cover = 42 - 53 mm

| | | |
|---|---|---|
| 34 | 32 | 32 |
| 34 | 34 | 32 |
| 32 | 32 | 34 |

RHT

Column → 10b-Kb (Indirect)

+122 +133
+126 +138
+125 +142

PL = 300 mm

The Measurements on this page were taken on 07/02 (16)

07/02/2023

Tower B → 20th Floor Common Areas

Slab → 5b-9b/Lb-Kb

Cover = 44 - 58 mm

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 36 | 32 | 38 |
| 38 | 36 | 38 |

RHT

Column → 4b-5b/Kb

Cover - 48 - 80 mm

+103 +104
+108 +112
+116 +104

PL = 300 mm

+79 } After reducing
+67 } Plastering

Column → 8q-9b/Cb

+81 +82
+81 +91
+87 +86

PL = 300 mm

Beam → 4b/Cb - Db (Indirect)

+66 +68 +65 +65 +66

PL = 250 mm

Slab → 5b-9b/Lb-Kb (Indirect)

+75 +70
+69 +63
+73 +72

PL = 300 mm

(Indirect) T

Column - 8b-9b/Kb

cover = 68 - 77 mm

Column → 8b-9b/Cb

Cover = 42 - 57 mm

Beam → 4b/Kb-3b

cover = 43 - 59 mm

Slab → 3b/4b - 5b-Kb

cover = 43 - 46 mm

| | | |
|---|---|---|
| 32 | 32 | 36 |
| 34 | 34 | 38 |
| 36 | 38 | 35 |

RHT

The Measurements on this page were taken on 07/02 (17)

07/02/2025

Column → 3b-4b / 4b-5b (Indirect)

| | | | |
|---|---|---|---|
| +93 | +96 | +98 | +88 |
| +93 | +84 | +88 | +84 |
| +96 | +88 | +89 | +83 |
| +87 | +84 | +95 | +84 |
| +83 | +82 | +86 | +75 |

PL = 300 mm

## Tower B 19th Floor Common Area

lab - 4b-9b / Cb-Bb
Cover = 43 - 54 mm

:0 +82
11 +74
93 +76
= 308 mm

| | | |
|---|---|---|
| 40 | 32 | 38 |
| 38 | 34 | 32 |
| 34 | 32 | 38 |

RHT

olumn → Eb-Fb / 9b-11b
over = 60-69 mm

eam - 4b / Jb-Kb
Cover = 38-46

Column → 4b-5b / Cb
Cover = 66-72 mm

Column → 8b-9b / Kb (Indirect)

| | |
|---|---|
| +112 | +120 |
| +112 | +116 |
| +107 | +106 |

PL = 300 mm

+92 | After rem
+67 | rity plast

Colum → 8b-9b / Kb
Cover = 70-75 mm

Slab = 33-38 mm
4b-3b / Kb-Jb

| | | |
|---|---|---|
| 28 | 30 | 36 |
| 28 | 28 | 34 |
| 32 | 32 | 36 |

The Measurements on this page were taken on 07/02

18

07/02/2025

Column → 9b-11b / Eb-Fb (Indirect)

| | | | |
|---|---|---|---|
| +94 | +98 | +91 | +95 |
| +90 | +99 | +98 | +95 |
| +86 | +97 | +95 | +91 |
| +101 | +84 | +88 | +91 |
| +78 | +99 | +86 | +85 |

PL = 300 mm

Beam → 8b-9b / Cb-Db (Direct)

+73 +70 +75 +70 +75

PL = 270 mm

Column → 4b-5b / Kb (Indirect)

| | |
|---|---|
| +124 | +107 |
| +98 | +99 |
| +98 | +98 |

PL = 300 mm

The Measurements on this page were taken on 07/02

no metal scale

19

07/02/2023

Tower (B) 18th Floor Common Area.

Beam → 8b-9b / Db-Cb (Direct)

+58 +57 +62 +68 +63

DL = 230 mm

Column = 9b-11b / Eb-Fb

Cover = 67 - 75 mm

Slab - Eb-Hb / 3b-4b

Cover = 42-47 mm

| | | |
|---|---|---|
| 34 | 36 | 36 |
| 34 | 38 | 38 |
| 36 | 40 | 40 |

Beam - Eb-Fb / 8b-10b

Cover = 46-57 mm

umn → 4b-5b / Kb

+91 +92 | Indirect

+98 +98 | PL = 300mm

+92 +97 |

Beam - 8b-9b / Db-Cb

Cover = 42-51 mm

Slab - Cb-Db / 8b-10b

Cover = 43-50mm

| | | |
|---|---|---|
| 32 | 34 | 34 |
| 32 | 32 | 34 |
| 32 | 32 | 34 |

Column → 2b-4b / Eb-Fb

+96 +98 +88 +94

+85 +93 +96 +98 | PL = 300 mm

+90 +82 +81 +89

+84 +99 +98 +80

+83 +83 +81 +84

Slab - 4b-9b / Kb-Lb →

Cover = 42-54 mm

+68 +68

+69 +68 | PL = 300mm

+72 +73

The Measurements on this page were taken on ..... 8/2/23

28

08/02/2023

Tower - B 19th Floor.

Flat NO 1908

Beam → Cb / 2b-3b

Cover = 30-54mm

+79 +78 +81 +88 +87 +84

PL = 270 mm

Slab → 3b-5b / Bb-Cb

Cover = 42-55 mm

| | | |
|---|---|---|
| 30 | 30 | 32 |
| 34 | 32 | 36 |
| 36 | 34 | 32 |

RHT

Column → Cb / 1b

+86 +115

+100 +136 | PL = 300mm

+79 +115

Slab → Cb-Eb / Bb-Cb

Cover = 31-59 mm

| | | |
|---|---|---|
| 32 | 34 | 34 |
| 34 | 36 | 32 |
| 36 | 32 | 36 |

RHT

Column → 3b / Cb

Cover = 59-76mm

+106 +106

+90 +87 | PL = 300mm

+104 +84

21

08/02/2023

Tower B 20th Floor

Flat NO - (2001)

Beam -> 10b-11b/Cb (Direct)

+91 + 91 + 92 + 93 + 92

PL = 290 mm

Slab -> 11b-12b / Ab-Bb

Cover = 25 - 47 mm

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 36 | 32 | 38 |
| 36 | 34 | 38 |

RHT

Column - Bb / 12b (Indirect)

| | |
|---|---|
| +88 | + 88 |
| +81 | + 86 |
| + 83 | + 85 |

PL = 300 mm

Slab -> 10b-11b / Ab-Bb

Cover = 46 - 56

| | | |
|---|---|---|
| 34 | 34 | 52 |
| 32 | 28 | 28 |
| 34 | 32 | 34 |

Beam -> Bb / 10b-11b

Cover -> 48 - 59 mm

Column -> 11b / Bb (Indirect)

| | |
|---|---|
| +87 | ~~+83~~ |
| +83 | |
| +79 | |
| +76 | |
| + 86 | |

PL = 300 mm



08/02/2023

Tower - B 19th Floor.

Flat NO (1904)

Beam - Kb / 10b - 11b

+93 + 95 + 100 + 106 + 107

PL = 290 mm

Slab -> Kb-Hb / 10b-11b

Cover = 37 - 47 mm

| | | |
|---|---|---|
| 36 | 36 | 34 |
| 34 | 32 | 34 |
| 36 | 32 | 32 |

RHT

Beam -> Kb / 10b - 11b

Cover = 44 - 57 mm

Slab -> ~~11~~b - 12b / Hb - 2b

Cover -> 42 - 56 mm

| | | |
|---|---|---|
| 32 | 34 | 34 |
| 36 | 32 | 32 |
| 34 | 36 | 36 |

RHT

Column -> 12b / Hb (Indirect)

| | |
|---|---|
| +139 | + 124 |
| +117 | + 118 |
| + 100 | + 103 |

PL = 300 mm

Column -> 12k / Kb (Indirect)

| | |
|---|---|
| +88 | + 84 |
| + 90 | + 91 |
| + 95 | + 98 |

PL = 300 mm

Column -> 11b / Kb

Cover = ~~Hb-10b~~ 63 - 70 mm

Column -> 10b - 11b / Kb

| | |
|---|---|
| + 103 | + 99 + |
| + 118 | + 88 + |
| + 98 | + 87 + |

PL = 300 mm

08/02/2023

Tower - B 20th Floor

Flat no - 2002

Beam - Cb/2b-3b

+83 +85 +84 +85 +90

PL = 290 mm

Slab → 3b-4b/Bb-Ab

Cover = 38-45mm

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 32 | 32 | 36 |
| 36 | 32 | 36 |

RHT

Beam → Bb/3b-5b

Cover = 31-54mm

Column → Cb/1b

| | |
|---|---|
| +83 | +98 |
| +92 | +87 |
| +82 | +99 |

PL = 300mm

Column → Cb/3b

| | |
|---|---|
| +92 | +80 |
| +98 | +84 |
| +101 | +99 |

PL = 300mm

Colum → Ab/Bb

Cover - 58-62mm

| | | |
|---|---|---|
| +67 | +174 | |
| +61 | → 178 | |
| +61 | + | 173 |

PL = 340, 150, 100, 200

Beam → 2b-Bb/Bb

Cover = 84-100

Slab → 2b-3b/Bb-Ab

Cover = 42-49 mm

| | | |
|---|---|---|
| 32 | 32 | 34 |
| 32 | 34 | 34 |
| 36 | 32 | 32 |

RHT



08/02/2023

Tower (B) 20th Floor.

Flat NO → 2004

Beam → Kb/10b-11b

+76 +75 +74 +76 +75

PL = 250mm

Column → 10b/Kb

| | |
|---|---|
| +88 | +90 |
| +90 | +85 |
| +91 | +84 |

PL = 300mm

Column → 12b/Nb

| | |
|---|---|
| +89 | +83 |
| +87 | +88 |
| +89 | +78 |

PL = 300mm

Slab → Lb-Kb/11b-12b

Cover = 41-49mm

| | | |
|---|---|---|
| 36 | 32 | 34 |
| 34 | 34 | 32 |
| 36 | 36 | 34 |

RHT

Beam →

Cover =

Slab = 11b-12b/Nb-Lb

cover = 37-42mm

| | | |
|---|---|---|
| 32 | 34 | 38 |
| 34 | 32 | 32 |
| 36 | 36 | 36 |

RHT

Beam = 2b/11b-12b

Cover - 18-32mm

08/02/2023

# Tower B 21st Floor

Flat NO → 2102

Beam → Cb/2b - 3b

+106 + 102 + 104 + 104 + 103

PL = 300 mm

Column → 2b / Cb

Cover - 70-89mm

Column → 1b / Bb

| | |
|---|---|
| +80 | +88 |
| +84 | +81 |
| +86 | +83 |

PL = 300mm

Column - Cb / 1b

| | |
|---|---|
| +86 | +92 |
| +87 | +98 |
| +84 | +97 |

PL = 300mm

slab → 1b-2b / Ab-Bb

Cover = 34-54 mm

| | | |
|---|---|---|
| 32 | 32 | 36 |
| 36 | 32 | 34 |
| 32 | 34 | 32 |

RHT

Beam → Bb / 1b-2b

Cover = 49 - 55 mm

Slab - Bb-Cb / 1b-2b

Cover = 55 - 67 mm

| | | |
|---|---|---|
| 34 | 32 | 34 |
| 32 | 30 | 32 |
| 34 | 32 | 32 |

RHT



08/02/2023

# Tower B 22nd Floor

Flat NO → 2202

Beam → Cb'-Fb / 2b

+100 + 100 + 99 + 100

PL = 290 mm

Cover = 48 - 53 mm

Slab → 3b - 5b / Ab - Bb

Cover = 40 - 50mm.

| | | |
|---|---|---|
| 28 | 28 | 28 |
| 30 | 28 | 30 |
| 28 | 32 | 30 |

RHT

Column → 3b / Cb

| | |
|---|---|
| +84 | +91 |
| +82 | +77 |
| +85 | +82 |

PL = 250 mm.

slab → Cb - Fb / 1b - 2b

Cover = 39 - 43 mm

| | | |
|---|---|---|
| 28 | 28 | 32 |
| 32 | 24 | 28 |
| 32 | 24 | 34 |

RHT

Column → 2b / Ab

| | |
|---|---|
| +99 | +98 |
| +100 | +99 |
| +99 | +98 |

Indirect

08/02/2023

Flat → 2204

Beam → Kb | 10b - 11b

+76 +72 +76 +77 +74

PL = 260mm

lab - 2b - Kb / 11b - 12b

Cover = 48 - 52 mm

| | | |
|---|---|---|
| 30 | 30 | 32 |
| 28 | 28 | 30 |
| 32 | 30 | 32 |

RMT

seam → Kb | 11b - 12b

Cover = 43 - 48mm

slab → 10b - 11b / 2b - Mb

Cover = 41 - 56 mm

| | | |
|---|---|---|
| 32 | 32 | 30 |
| 32 | 30 | 30 |
| 30 | 32 | 32 |

RMT

Beam → 2b | 10b - 11b

Cover = 66 - 74 mm

Column → Kb | 12b

+100 +103
+110 +111
+100 + 99

PL = 300 mm



08/02/2023

Tower B 23rd Floor

Flat No → 2302

Beam → Cb / 2b - 3b (Direct)

+77 +75 +73 +77 +74

PL = 270mm

Cover = 51 - 63 mm

slab → 1b - 2b / Ab - Bb

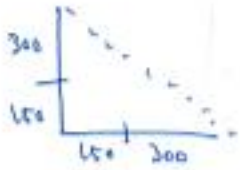
Cover = 44 - 51 mm

| | | |
|---|---|---|
| 30 | 26 | 28 |
| 28 | 30 | 30 |
| 28 | 26 | 30 |

RMT

Column → 2b / Bb

+64 +173
+58 +175
+62 +176




slab → Bb - Cb / 2b - 3b

Cover = 63 - 58 mm

| | | |
|---|---|---|
| 28 | 28 | 30 |
| 32 | 29 | 30 |
| 28 | 30 | 32 |

RMT

Column → Cb / 3b

+66 +64
+64 +64
+64 +64

PL = 250 mm

08/02/2023

# Tower B 23rd Floor

Flat NO = 2301

Beam -> 10b - 11b / Cb

+78 +77 +79 +80

PL = 260 mm

Cover : 32 - 42 mm

Slab -> 10b - 11b / Cb - Bb

Cover = 52 - 60 mm

| | | |
|---|---|---|
| 30 | 30 | 28 |
| 28 | 28 | 30 |
| 30 | 28 | 28 |

RHT

Slab - Bb - Cb | 11b - Nb

cover = 33 - 41 mm

| | | |
|---|---|---|
| 28 | 30 | 30 |
| 32 | 28 | 28 |
| 32 | 32 | 28 |

RHT

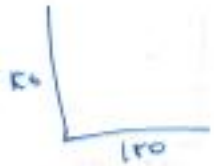
Column -> 12b / Ab

| | |
|---|---|
| +104 | +96 |
| +91 | +96 |
| +99 | +89 |

PL = 300mm

Column - Cb / 10b

+78
+83
+78
+75
+75






08/02/2023

# Tower B 26th Floor Common Area

Column -> 9b - 11b / Fb - Eb

PL = 300mm

| | | | |
|---|---|---|---|
| +76 | +77 | +78 | +77 |
| +98 | +96 | +92 | +92 |
| +88 | +91 | +95 | +87 |
| +99 | +100 | +98 | +101 |
| +101 | +98 | +99 | +97 |

+77 (Middle Bowing Reading)

Column -> 4b - 5b / Kb

| | |
|---|---|
| +112 | +122 |
| +116 | +111 |
| +112 | +110 |

PL = 300

Cover = 52 - 61 mm

Column - Cb / 5b

| | |
|---|---|
| +102 | +97 |
| +87 | +90 |
| +93 | +90 |

PL = 300mm

Slab -> 8b - 9b / 10b - Jb - Kb

Cover = 33 - 44 mm

| | | |
|---|---|---|
| 28 | 28 | 28 |
| 30 | 32 | 30 |
| 32 | 30 | 30 |

RHT

Beam = 8b - 9b / Jb - Kb

Cover = 28 - 48 mm

+66 +65 +72 +68 +69

PL = 230

Slab -> 4b - 9b / Lb - Kb

Cover = 38 - 48 mm

| | | |
|---|---|---|
| 34 | 34 | 38 |
| 36 | 36 | 38 |
| 32 | 38 | 36 |

RHS

| | |
|---|---|
| +76 | +72 |
| +74 | +72 |
| +73 | +74 |

PL = 300 mm

07/02/2023

Beam → 4b – 5b – 6b
Cover = 35 – 45 mm

+66 + 61 + 64 + 66 + 65

PL = 230 mm

Slab → 3b-4b / 5b-6b
Cover = 40 – 50 mm

| | | |
|---|---|---|
| 32 | 30 | 30 |
| 28 | 28 | 32 |
| 30 | 32 | 30 |

RHT



08/02/2023

# Tower B 25th Floor Common Area.

Beam → 8b-9b / 9b-10b
Cover = 38 – 44 mm

+65 + 65 + 66 + 67

PL = 230 mm

Beam → 5b-9b / 8b
Cover = 38 – 44 mm

+54 + 62 + 57 + 59

PL = 240 mm

Slab → 4b-5b / 4b-3b
Cover = 24 – 45 mm

| | | |
|---|---|---|
| 28 | 28 | 34 |
| 32 | 32 | 30 |
| 28 | 34 | 34 |

RHT

Beam → 4b-6b / 4b-3b
Cover = 25 – 49 mm

Slab → 9b-10b / 8b-10b
Cover = 35 – 42 mm

| | | |
|---|---|---|
| 30 | 30 | 32 |
| 32 | 28 | 28 |
| 30 | 30 | 28 |

RHT

Column → 8b-9b / 9b
Cover = 53 – 88 mm

+91 + 100
+99 + 99
+99 + 100

PL = 300 mm

column → 4b-2b / 4b-6b

+121 + 126 + 115 + 126
+122 + 117 + 132 + 123
+122 + 130 + 122 + 115
+127 + 129 + 108 + 122
+118 + 106 + 110 + 105
+ 96 + 102 +

PL = 300 mm

+81
+87
After removing plaster

08/02/2023

Tower B 24th Floor Common Area.

Slab → ~~9b-11b~~ 4b-9b/2b-4b

Cover = 28-48 mm

| | | |
|---|---|---|
| 30 | 30 | 20 |
| 28 | 32 | 30 |
| 28 | 30 | 30 |

RHT

Slab - ~~8b~~-9b/2b-4b

| | |
|---|---|
| +82 | +83 |
| +83 | +79 |
| +77 | +84 |

PL = 300mm

Column → 4b-9b / 9b-11b

| | | |
|---|---|---|
| +112 | +98 | +97 |
| +97 | +98 | +107 |
| +107 | +98 | +95 |

(+77 +85) → After removing slushy

PL = 300mm

Beam = 8b-9b/5b-4b

Cover = 38-56 mm

Beam - 5b-9b/2b

+70 +66 +69 +71

PL = 230 mm

Column → 8b-9b / 4b

| |
|---|
| +122 |
| +128 |
| +112 |
| +114 |

PL = 300 mm



08/02/2023

Slab - 3b-4b/Db-Cb

Cover = 38-48mm

| | | |
|---|---|---|
| 30 | 38 | 38 |
| 32 | 34 | 34 |
| 36 | 32 | 38 |

RHT

Column → 4b-5b / Cb

| | |
|---|---|
| +85 | +117 |
| +116 | +86 |
| +86 | +115 |

PL = 300mm

Beam → 4b/Db-Cb

Cover = 38-48 mm

Beam → 4b-5b / Cb-Db

+57 +82 +58 +60

PL = 230mm

08/02/2023

Tower (B) 28rd Floor Common Area

lab → 5b-9b / Cb-Bb

94 + 95
98 + 99
116 + 102
PL = 300 mm

Cover = 40-44 mm

| | | |
|---|---|---|
| 28 | 30 | 28 |
| 30 | 28 | 28 |
| 30 | 28 | 28 |

Beam → 5b-9b / Bb

+68 +68 +64 +64 +66

PL = 250 mm

Column → 4b-5b / Kb

+91 + 84
+88 + 94
+83 + 86
PL = 300 mm

lab → 3b-6b / 3b-4b

Cover = 32-44 mm

| | | |
|---|---|---|
| 32 | 28 | 30 |
| 32 | 30 | 30 |
| 28 | 30 | 32 |

Beam → 3b-4b / Hb-6b

+62 +67 +61 +62 +62

PL = 240 mm

Cover = 28-42 mm

Column → Hb-6b / 2b-4b

+134 +106
+101 +95
+92 +98
PL = 300 mm



08/02/2023

Column - 8b-9b / Kb

+97 + 108
+119 + 104
+112 + 104
PL = 300 mm

Beam → 8b-9b / Jb-Kb

+75 +77 +84 +88 +92

PL = 270 mm

Tower (B) 25th Floor 09/02/2023

Flat NO - (2501)

Beam → Cb/10b-11b (Direct)

+85 +112 +110 +112 +112

PL = 330 mm

Cover = 39-65 mm

Slab → 10b-11b/Ab-Bb

Cover = 41-48 mm

| | | |
|---|---|---|
| 30 | 30 | 32 |
| 28 | 30 | 32 |
| 28 | 30 | 28 |

Beam = 10b-11b/Bb

Cover = 54-68 mm

Slab → Cb-Fb/10b-11b

Cover = 38-58 mm

| | | |
|---|---|---|
| 30 | 32 | 28 |
| 30 | 32 | 30 |
| 30 | 28 | 28 |

RHT

Column → 10b/Cb (Semi direct)

Cover = 38-57 mm

+85
+76
+82
+78

150
150

Column → 11b/Cb (Indirect)

+84 +98
+77 +98
+77 +94

PL = 300 mm



Tower B 25th Floor 09/02/2023

Flat - (2503)

Beam → Kb/2b-3b (Direct)

+77 +81 +77 +85 +84

PL = 280 mm

Slab → 3b-5b/4b-Lb

Cover = 31-48 mm

| | | |
|---|---|---|
| 32 | 30 | 32 |
| 28 | 28 | 30 |
| 30 | 32 | 32 |

RHT

Column → 2b-/Kb (Semi direct)

+60
+68
+72

Semi direct

150

Column → 5b/Kb (Indirect)

Cover = 68-90 mm

+68 +66
+71 +69
+66 +68
+68

PL = 250 mm

Slab → Lb-Kb/1b-2b

Cover = 29-51 mm

| | | |
|---|---|---|
| 32 | 32 | 30 |
| 28 | 32 | 28 |
| 32 | 32 | 30 |

Beam → Lb/1b-2b

Cover = 46-60 mm

09/02/2023

Tower B - 25th Floor

Flat → 2502

Beam → 2b-3b/cb (Direct)

+75 +83 +90 +89 +88

PL = 250mm

Slab → 2b-3b/Ab-Bb

Cover = 48-54mm

| | | |
|---|---|---|
| 32 | 32 | 30 |
| 30 | 28 | 28 |
| 30 | 30 | 30 |

RHT

Column → 2b/Cb (Indirect)

Cover = 68-72mm

| | |
|---|---|
| +98 | +99 |
| +97 | +99 |
| +102 | +96 |

PL = 300mm

Beam → 2b-3b/Bb

Cover = 60-66mm

Slab → 3b-5b/Ab-Bb

Cover = 46-60mm

| | | |
|---|---|---|
| 28 | 28 | 30 |
| 28 | 32 | 32 |
| 34 | 32 | 34 |

RHT

Column → 3b/cb (Indirect)

| | |
|---|---|
| +75 | +74 |
| +76 | +74 |
| +64 | +66 |

PL = 250mm

Beam → Bb/3b-5b

Cover = 48-56mm

40

09/02/2023

Tower - B 26th Floor

Flat → 2602

Beam → 2b-3b/Cb (Direct)

Cover = 37-48mm

+89 +87 +93 +88 +89

PL = 300mm

Slab → Cb-Fb/2b-Fb

Cover = 29-36mm

| | | |
|---|---|---|
| 28 | 28 | 28 |
| 30 | 32 | 30 |
| 28 | 32 | 30 |

RHT

Slab → Bb-Cb/1b-2b

Cover = 43-52mm

| | | |
|---|---|---|
| 30 | 30 | 28 |
| 32 | 32 | 30 |
| 28 | 28 | 30 |

RHT

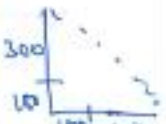
Beam → Bb-Cb/2b

Cover = 39-48mm

Column = 2b/Bb (Semidirect)

Cover = 58-63mm

| | |
|---|---|
| +56 | +162 |
| +57 | +165 |
| +54 | +164 |




Colum → Cb/1b (Indirect)

| | |
|---|---|
| +87 | +86 |
| +96 | +100 |
| +93 | +102 |

PL = 300mm

41

09/02/2023

Tower (B) 26th Floor  Flat → 2601

Beam → Cb/10b-11b (Direct)

Cover = 42-58 mm

+104 +102 +98 +98 +98

PL = 300 mm

Slab → 11b-12b/Ab-Bb

Cover = 45-61 mm

| | | |
|---|---|---|
| 30 | 30 | 28 |
| 28 | 28 | 32 |
| 32 | 30 | 30 |

Beam → Bb/11b-12b

Cover = 51-67 mm

Slab → Bb-Cb/10b-11b

Cover = 39-48 mm

| | | |
|---|---|---|
| 32 | 32 | 36 |
| 32 | 34 | 34 |
| 34 | 32 | 36 |

R+T

Slab → 10b-11b/Bb-Cb (Indirect)

| | |
|---|---|
| +105 | +97 |
| +88 | +104 |
| +123 | +102 |

PL = 300mm



09/02/2023

Tower (B) 26th Floor

Flat NO → 2604

Beam → Kb/10b-11b (Direct)

Cover = 51-68

+80 +84 +83 +82 +83

PL = 280 mm

Slab → Kb-Gb/10b-11b

Cover = 39-48 mm

| | | |
|---|---|---|
| 28 | 30 | 28 |
| 30 | 30 | 28 |
| 28 | 28 | 28 |

R+T

Column → Kb/11b (Indirect)

| | |
|---|---|
| +84 | +80 |
| +82 | +94 |
| +98 | +100 |

PL = 300 mm

Column → 12b/Ab (Indirect)

| | |
|---|---|
| +81 | +99 |
| +83 | +99 |
| +88 | +102 |

PL = 300mm

Slab → 2b-1cb/11b-12b

Cover = 37-47 mm

| | | |
|---|---|---|
| 26 | 26 | 30 |
| 28 | 30 | 28 |
| 26 | 28 | 26 |

R+T

09/02/2023

Tower (A) 24th Floor

Flat NO → 2404

Beam → Kb/10b-11b (Direct)



09/02/2023

Tower (B) 21st Floor

Flat NO → 2101

Beam → Cb/10b-11b (Direct)

Cover = 46 - 52mm

+93 +87 +87 +85 +91 +89+

PL = 250 mm

Slab → Cb-Fb/10b-11b

Cover : 38-58 mm

| | | |
|---|---|---|
| 36 | 36 | 32 |
| 34 | 32 | 34 |
| 32 | 32 | 36 |

RFT

Slab → Ab-Bb/11b-12b

Cover = 39-48 mm

| | | |
|---|---|---|
| 30 | 30 | 34 |
| 34 | 32 | 30 |
| 34 | 30 | 32 |

Beam = Bb/11b-12b

Cover = 40-55 mm

Column → Bb/12b

Cover = 46-54mm

Column → 11b/Ab

| | |
|---|---|
| +70 +63 | PL = 250 mm |
| +77 +68 | |
| +70 +83 | |

Column → Cb/12b (Indirect)

cover = 42-52 mm.

| | |
|---|---|
| +60 +88 | PL = 300mm |
| +91 +90 | |
| +86 +92 | |

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Tower B 21st Floor

Flat = 2104

Beam = Kb/10b-11b (Direct)

+78 +78 +76 +78 +80

PL = 270mm

Cover = 52-67 mm

Column = Kb/12b

Cover = 45-58 mm

Column → 11b/Kb

cover: 43/53mm

Slab = Kb-Gb/10b-11b

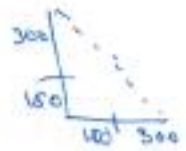
Cover = 40-45 mm

| | | |
|---|---|---|
| 30 | 28 | 30 |
| 30 | 28 | 28 |
| 25 | 30 | 30 |

RMT

Colum = 11b/Lb (semi direct)

| | |
|---|---|
| +58 | +176 |
| +57 | +183 |
| +59 | +170 |




Slab = Lb-Kb/Kb-12b

Cover = ~~28-32~~ 35-38.

| | | |
|---|---|---|
| 30 | 30 | 30 |
| 32 | 32 | 28 |
| 32 | 30 | 28 |

Column → Kb/10b (Cndirect)

| | |
|---|---|
| +76 | +82 |
| +88 | +81 |
| +75 | +88 |

PL = 300mm

Beam = Lb-Kb/11b

Cover = 40-48 mm



Tower (B) 24th Floor

09/02/2023

Flat NO → 2404

Beam → Kb/10b-11b

Cover = 32-48

84 +85 +86 +85 +84

Slab → Kb-Gb/10b-11b

Cover = 32-41 mm

| | | |
|---|---|---|
| 32 | 32 | 36 |
| 32 | 34 | 32 |
| 32 | 36 | 36 |

RMT

Colum → 11b/Lb

Cover = 58-67 mm

Slab → Lb-Kb/10b-11b

Cover = 37-48 mm

| | | |
|---|---|---|
| 28 | 28 | 30 |
| 28 | 32 | 28 |
| 28 | 30 | 32 |

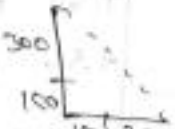
Column → 10b/Kb (Indirect)

| | |
|---|---|
| +70 | +63 |
| +65 | +63 |
| +67 | +70 |

PL = 250mm

Column → Lb/11b (Semi direct)

| | |
|---|---|
| +60 | +183 |
| +57 | +185 |
| +58 | +183 |




Column → Kb/12b (Indirect)

| | |
|---|---|
| +88 | +92 |
| +95 | +96 |
| +86 | +99 |

PL = 300mm

Tower (A) 23rd Floor

Flat No → (2304)

Beam → Kb/Lob-11b (Direct)

Cover =

+84 + 85 + 91 + 84 + 85

Pl = 280mm

Column → 11b/Lb (Semi direct)

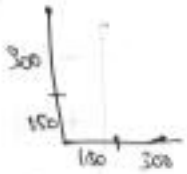
| | |
|---|---|
| +75 | +73 |
| +78 | +80 |
| +77 | +70 |

Pl = 250mm

Column → Lob/Kb (Indirect)

Cover = 58-69mm

| | |
|---|---|
| +57 | +170 |
| +69 | +169 |
| +56 | +172 |




Slab → Lob-8b/Mb-2b

Cover = 42-53mm

| | | |
|---|---|---|
| 30 | 30 | 28 |
| 28 | 28 | 28 |
| 30 | 28 | 28 |

RHT

Slab → Mb-Nb/Mb-2b

Cover = 30-39mm

| | | |
|---|---|---|
| 26 | 26 | 30 |
| 30 | 26 | 30 |
| 26 | 26 | 26 |

RHT

Beam → 2b/11b-12b

Cove = 38-57mm

Tower (B) 20th Floor

Flat No → (2003)

Slab → 2b-Kb/2b-3b

Cover = 47-50mm

| | | |
|---|---|---|
| 28 | 28 | 30 |
| 32 | 30 | 30 |
| 28 | 30 | 32 |

RHT

Beam → Kb/2b-3b

Cover = 31-42mm

Slab → 3b-5b/2b-Kb

Cover = 36-46mm

| | | |
|---|---|---|
| 30 | 30 | 32 |
| 32 | 34 | 30 |
| 30 | 32 | 34 |

RHT

Column → 3b/Kb (Indirect)

Cover = 56-61mm

| | |
|---|---|
| +108 | +102 |
| +105 | +104 |
| +112 | +103 |

Pl = 300mm

Column - 2b/1b (Indirect)

| | |
|---|---|
| 486 | +82 |
| +90 | +80 |
| +87 | +86 |

Pl = 300mm

09/02/2023

Tower B 21st Floor Common Area

Column → 8b-11b / Eb-Fb (Semi direct) & Indirect

+67
+62
+56
+57
+61

150 / 150

+96 +88 +94 +94
+103 +102 +98 +94
+109 +129 +108 +104
+115 +112 +112 +115
+112 +103 +112 +111

P2 = 300mm

Beam → 8b-9b / Cb-Db (Direct)

PL = 250mm

+66 +70 +69 +71 +77

Beam → 4b / Kb-5b

+62 +63 +62 +68 +74

PL = 220mm

Column → 8b-9b / Cb (Indirect)

+99 +106
+122 +103
+111 +112

PL = 300mm

(+74 +95)
(Ashay plastering)
Remove

slab → 8b-10b / 10b (5b-Kb)

+105 +102
+93 +94
+101 +118

PL = 300 mm



09/02/2023

Tower B 22nd Floor Common Area

slab → 5b-9b / Bb-Cb (Indirect)

+98 +100
+105 +96
+96 +102

PL = 300mm

Beam → 5b / Cb-Db (Direct)

+64 +65 +68 +72 +69

PL = 230mm

Column → 4b-5b / Cb (Indirect)

+120 +143
+123 +118
+142 +132

P2 = 300mm

Beam → 8b-9b / Kb-5b

+59 +62 +58 +68 +52

PL = 230

column → 4b-2b / Eb-Db (Indirect)

+110 +111
+119 +123
+98 +99

P2 = 300mm

Column - 4b / Kb (Indirect)

+127 +118
+118 +124
+122 +125

PL = 300mm

+62
+80

Ashay Removing plaster.

TOWER-B

10/02/2023

FLAT NO- 2402

Beam 2b/3b - Cb

UPVT (Direct) PL = 260mm

+87 +94 +65 +89 +97

Cover: 45-58

2b/3b/Cb/Bb

ab = 39/44 mm cover

RHT -

28, 26, 29

29, 28, 28

29, 30, 32

Column - 2b/Bb

54-63 mm Cover

Slab

Cover - 49-58mm

RHT

30, 38, 34

34, 36, 30

30, 32, 36

Column - 2b/Cb

PL = 250mm

+67 +66 +73

+67 +69 +70

+ + +

Column - Bb/1-b

PL - 300

+78 +87 +

+80 +88

+87 +94



Tower B 2201 22nd floor 10/2/23

Gr. 10-11b/Cb

Slab

| | | |
|---|---|---|
| 26 | 28 | 26 |
| 26 | 28 | 26 |
| 28 | 26 | 26 |

cover:- 39 to 46

Slab Bb-Ab/11b-12b

| | | |
|---|---|---|
| 26 | 28 | 28 |
| 26 | 28 | 30 |
| 28 | 26 | 26 |

cover:- 40 to 56

Beam :-

cover: 32 to 58

+81 +89 +92 +92 +89+

PL: 280 mm

12b - Ab

Column

cover: 48 to 62

+83+85+

+76+91+

+87+98+

11b — Ab

Column

PL: 300mm

+91+

+88+

+96+

+105+

+98+

4th floor Tower B (1603) 10/2/23

Beam :- Kb/2b-5b

+70+72+75+77+77+

PL :- 270 mm

cover :- 39 to 48 mm

slab 2b-3b/Kb-Lb

| | | |
|---|---|---|
| 28 | 30 | 30 |
| 28 | 32 | 30 |
| 32 | 28 | 28 |

cover :- 39 to 56 mm

slab

Grid :- Kb-Lb/1b-2b

cover :- 39 to 50 mm

→ RHT

| | | |
|---|---|---|
| 28 | 34 | 32 |
| 28 | 28 | 34 |
| 34 | 32 | 30 |

Beam :- Kb-Lb/2b

cover :- 42 to 58 mm

direct RC column

Grid :- 3b/Kb

+ 84+83+84+

300 +85+90+89+

+84+86+44+

cover :- 56 to 68 mm

direct RC column

Grid :- Lb/2b

+ 101 + +

+ 97 + +

300 +100+ +

+ 97+ +

+ 94 + +

cover :- 67 to 78 mm

54

16th floor Tower B (1602) 10/2/23

Grid :- 3b-2b/Cb

Beam

+84+87+79+89+92+

PL :- 290 mm

cover :- 39 to 52 mm

slab

Cb-Fb/2b-3b

| | | |
|---|---|---|
| 28 | 30 | 32 |
| 30 | 32 | 28 |
| 32 | 28 | 30 |

cover 37 to 42 mm

:. column Grid :- 2b/Bb

PL :- 300 +85+ cover 52 to 68 mm

+84+

+74+ Indirect

+73+

+75+

column

Grid :- Cb/3b

+98+97+

+98+93+ Indirect

+93+92+

Slab

Grid :- 3b-4b/Cb/Bb

cover :- 27 to 49

| | | |
|---|---|---|
| 28 | 30 | 28 |
| 30 | 28 | 32 |
| 28 | 32 | 30 |

column

Grid :- Eb/3b PL :- 300

cover :- 38 to 58

+118+110+

+119+95+ Indirect

+101+93+

56

2nd floor B Tower (2001)

10/2/23

Grid :- 10b-11b/Cb

+74+74+87+69+84+81+

Cover :- 26 to 46 mm

PL :- 260 mm

Column Gr Ab/11b

200 + 84 + 86 +

Direct + 82 + 78 +

+ 75 + 69 +

Cover :- 74 to 85

Slab

8b-10b/Cb-Bb

Cover :- 41 to 49

| | | |
|---|---|---|
| 30 | 36 | 32 |
| 34 | 32 | 30 |
| 36 | 34 | 32 |

Slab :-

Grid :- 10b-11b/Cb-Bb

Cover 52 to 60 mm

| | | |
|---|---|---|
| 28 | 25 | 30 |
| 30 | 30 | 25 |
| 28 | 25 | 28 |

RC column Grid :- 10b/Cb

+90 +90+

+90 +85+ PL 300

+89 +98+ Eccentric

Cover 48 to 62



23rd Floor Halfcell

10/2/23

① RC Beam

Grid :- 3b/He-Eb

| | | |
|---|---|---|
| -178 | -175 | -189 |
| -185 | -193 | -184 |
| -178 | -174 | -190 |

carbonation up to reinforced level

② 21st Floor

RC platform (Hb-Eb/Hb-10b)

| | | |
|---|---|---|
| -122 | -127 | -145 |
| -130 | -142 | -149 |
| -139 | -149 | -146 |

carbonation up to reinforced level

③ RC BEAM - 18th Floor - (5b-8b/Lb)

| | | |
|---|---|---|
| -192 | -199 | -248 |
| -196 | -212 | -262 |
| -210 | -224 | -234 |

carbonation up to reinforced level

④ RC staor - 14th Floor - Eb-4b/3b

| | | |
|---|---|---|
| -198 | -224 | -212 |
| -221 | -201 | -201 |
| -214 | -256 | -214 |

(5) 12th Floor – Rc Beam Eb-Hb / 8b

| | | |
|---|---|---|
| -231 | -243 | -183 |
| -186 | -261 | -286 |
| -209 | -188 | -177 |

carbonation up to reinforced bar

(6) 10th Floor – Rc plate term – (Hb-Eb / 10b-Eb)

| | | |
|---|---|---|
| -274 | -207 | -193 |
| -193 | -203 | -206 |
| -236 | -185 | -279 |

carbonation up to reinforced level

(7) 9th Floor – Rc slab – (Eb-Hb/8b)

| | | |
|---|---|---|
| -193 | -251 | -281 |
| -246 | -261 | -236 |
| -262 | -211 | -289 |

carbonation up to reinforced level

8th Floor – Rc slab – (Hb-Eb / 10b-12b)

| | | |
|---|---|---|
| -193 | -211 | -246 |
| -242 | -231 | -248 |
| -248 | -216 | -224 |



(9) 7th Floor – (5b-8b / 8b-cb) – Rc slab

| | | |
|---|---|---|
| -244 | -193 | -262 |
| -245 | -259 | -223 |
| -252 | -334 | -316 |

carbonation up to reinforced level

(10) 4th Floor – Rc plate – (Hb-Eb / 10b-11b)

| | | |
|---|---|---|
| -247 | -197 | -245 |
| -271 | -260 | -228 |
| -272 | -293 | -243 |

carbonation up to reinforced level

(11) 3rd Floor – Rc slab – (5b-8b / cb-bb)

| | | |
|---|---|---|
| -254 | -264 | -290 |
| -283 | -296 | -288 |
| -274 | -224 | -263 |

carbonation up to reinforced level

(12) 3rd Floor - (E6 - H5 / H5 - E6) - RC slab

| | | |
|---|---|---|
| -270 | -204 | -292 |
| -258 | -263 | -293 |
| -267 | -277 | -273 |

carbonation up to reinforcement level

(13) 2nd Floor - RC slab - (D6 - B6 / A6 - B6)

| | | |
|---|---|---|
| -293 | -298 | -291 |
| -245 | -272 | -262 |
| -271 | -264 | -272 |

carbonation up to reinforcement level

(14) 1st Floor - RC slab (E6 - B6 / A6 - D6)

| | | |
|---|---|---|
| -298 | -271 | -291 |
| -288 | -291 | -286 |
| -288 | -272 | -285 |



(15) Ground Floor - Lift No: 3

| | | |
|---|---|---|
| -276 | -296 | -336 |
| -338 | -306 | -292 |
| -338 | -335 | -325 |

Tower B 404 — 11/2/23

Beam
cover :- 48 to 56
Grid Kb/10b-11b

+72+ 75+ 74+ 70+75+

PL :- 250

Rc column Grid:- 11b/Lb

+ 67 + 184
+ 59 + 180+
+ 58 + 171 +

Rc slab Grid:- 10b-11b/mb-Lb

| | | |
|---|---|---|
| 32 | 38 | 40 |
| 36 | 40 | 36 |
| 38 | 39 | 32 |

cover :- 37 to 42 mm

Rc Beam
Grid :- Lb/10b-11b
cover :- 43 to 62

Slab
Cover 46 to 47
Grid :- 10b-11b/2b-mb

| | | |
|---|---|---|
| 32 | 38 | 36 |
| 34 | 36 | 38 |
| 38 | 34 | 39 |

Rc colum Grid:- 11b-12b/mb

+ 87 +
+ 82 +
+ 79 +
+ 80 +
+ 86 +

PL 300
Indirect
Cover:- 46 to 58

63

21st floor — B 2103 — 11/2/23

Rc Beam
Grid :-
Cover :- Kb/2b-3b
Direct

+ 74 + 79+ 81 + 81 + 83 + 87+

PL : 260 mm
Cover: 36 to 80

Slab
Grid :- Kb-Gb/2b-3b
cover :- 40 to 60 mm

| | | |
|---|---|---|
| 34 | 36 | 32 |
| 32 | 34 | 36 |
| 34 | 32 | 34 |

22nd floor

3b-4b/Kb - Rc columns

Indirect - PL = 300 mm

+ 97 + 86 +
+ 88 + 93 +
+ 88 + 87 +

cover - 77 to 96 mm

2b-3b/Lb - Rc Beam

cover - 49 to 56 mm

2b-3b/Lb-mb - Rc slab

cover - 33-51 mm

RBU

| | | |
|---|---|---|
| 32 | 34 | 28 |
| 30 | 32 | 28 |
| 30 | 30 | 30 |

63

11/02/2023

Mb / Lb - Rc colums

cover - 32 to 44 mm

Indirect - PL = 300 mm

+ 110 + 99 +

+ 96 + 91 +

+ 93 + 92 +

Rc slab - (Lb - mb / lb - lb)

Roof

| | | |
|---|---|---|
| 32 | 30 | 30 |
| 31 | 30 | 28 |
| 30 | 30 | 32 |

~~40 to 47 mm~~

Rc Beam - Lb/Lb

cover - 52 to 60 mm



11/02/2023

2203 - modified Flat

cover - PL = 280 mm

Rc Beam - Sb/Sb - Lb

① + 83 + 77 + 79 + 80 + 84

② Lb - mb / lb - Lb - Rc slab

cover - 43 to 47 mm

| | | |
|---|---|---|
| 30 | 30 | 28 |
| 28 | 30 | 28 |
| 28 | 28 | 26 |

③ Rc colums - (Mb/Lb) Indirect

PL = 250 / 300 mm

+ 82 + 86 +

+ 84 + 86 +

+ 81 + 80 +

④ Rc slab - (Mb - Lb / lb - Lb)

Roof

| | | |
|---|---|---|
| 28 | 30 | 34 |
| 30 | 30 | 30 |
| 32 | 32 | 30 |

cover = 42 to 52 mm

11/02/2023

RC Beam - (Kb-Lb / 1b)

cover - 61 to 63 m.  PL = 250 mm

+ 70 + 73 + 69 + 76

RC colums - 3b/Kb

PL = 250 m.

+ 76 + 81 + 77

+ 71 + 77 +

+ 74 + 72 +

2303 - Modified Flat

3b - 5b / Lb - M5 - RC slab - Toilet

| | | |
|---|---|---|
| 24 | 26 | 24 |
| 30 | 26 | 24 |
| 28 | 30 | 30 |

cover = 43 to 57 m.

Rc colums - 3b/Kb

PL = 250 mm

+ 67 + 65 +

+ 65 + 63 +

+ 65 + 62 +



11/02/2023

Kb-Lb / 1b-2b - RC slab

cover - 42 to 52

| | | |
|---|---|---|
| 30 | 30 | 30 |
| 30 | 28 | 28 |
| 28 | 26 | 30 |

2b-3b / Hb-kb - RC slab

| | | |
|---|---|---|
| 32 | 28 | 24 |
| 30 | 28 | 30 |
| 30 | 28 | 28 |

cover = 39 to 48

Rc colums - Mb/Lb

+ 67 + 71 +

+ 69 + 69 +

+ 67 + 70 +

11/02/2023

~~27 Th Floor - Open Area~~

1901 - FLAT NO

Rc Beam - 10b - 11b / c b

| | | |
|---|---|---|
| 28 | 30 | 32 |
| 30 | 31 | 32 |
| 32 | 30 | 28 |

cover - ~~45 to 50 mm~~ 22 to 32

+ 81 + 82 + 77 + 82 + 90 ~~+72~~

PL = 260 mm

Rc slab - Bb - cb / 10b - 11b

cover - 41 to 50 mm

Rc slab - 10b - 11b / Ab - Bb

| | | |
|---|---|---|
| 28 | 30 | 32 |
| 30 | 30 | 30 |
| 28 | 30 | 30 |

cover - 42 to 53

Rc Beam - 10b - 11b / Bb

cover - 42 to 52



11/02/2023

(5)

Rc colums - Ab / 11b

PL = 250 mm

+ 75 + 94 + Individual

+ 95 + 91 +

+ 87 + 94 +

(6) Rc colums - Bb / 12b

PL = 300 mm Individual

+ 91 + 92 +

+ 90 + 96 +

+ 98 + 85 +

29 Th Floor - C Below Helipad

Rc slab - 5b - 8b / Lb - Kb UPVT Individual PL = 300

+ 70 + 76 + 67 + 72 + 64 +

+ 63 + 74 + 65 + 68 + 62 +

+ 64 + 68 + 71 + 76 + 64 +

+ 67 + 75 + 76 + 71 + 74 +

+ 73 + 63 + 76 + 74 + 70 +

+ 68 + 70 + 78 + 70 + 71 +

11/02/2023

REBOUND HAMMER

RBH

| | | |
|---|---|---|
| 36 | 34 | 38 |
| 36 | 34 | 36 |
| 36 | 34 | 34 |

cover = 43 to 52 mm

Rc Beam - (5b - 8b / Kb)

cover = 23 to 50 mm

Rc slab - (3b - 4b / Eb - Hb)

RBH

| | | |
|---|---|---|
| 32 | 34, | 36 |
| 34 | 32 | 36 |
| 34 | 32 | 34 |

cover - 39 to 53 mm

Rc slab - (8b - cb / 5b - 8b)

Indirect

PL = 300 mm

+ 64 + 68 + 67 + 72 + 75 +

+ 70 + 76 + 70 + 68 + 72 +

+ 70 + 65 + 71 + 74 + 73 +

+ 77 + 69 + 72 + 70 + 71 +

+ 71 + 71 + 77 + 73 + 77 +

+ 79 + 77 + 78 + 74 + 72 +



Rc slab - (Hb - Eb / 11b - 10b)

Indirect

PL = 300 mm

+ 66 + 78 + 75 + 71 + 74 +

+ 75 + 79 + 77 + 69 + 66 +

+ 66 + 75 + + 70 + 83 + 69 +

+ 67 + 72 + 77 + 74 + 65 +

+ 62 + 70 + 69 + 75 + 69 +

+ 63 + 73 + 78 + 67 + 78 +

Rc shear wall ( 10b - 11b / Eb)

Indirect

PL = 300 mm

+ 100 + 114 + 122 + 83 + 93 +

+ 114 + 112 + 84 + 76 + 94 +

+ 81 + 86 + 95 + 87 + 83 +

+ 91 + 105 + 93 + 79 + 67 +

+ 90 + 92 + 91 + 89 + 73 +

+ 87 + 105 + 119 + 103 + 96 +

+ 89 + 100 + 92 + 94 + 77 +

+ 90 + 94 + 99 + 106 + 80 +

+ 135 + 107 + 111 + 105 + 99 +

11/02/2023

Rc column — 11b / cb

direct.

PL = 340 mm

| | | |
|---|---|---|
| + | + | + |
| 91 | 88 | 89 |
| + | + | + |
| 92 | 87 | 91 |
| + | + | + |
| 94 | 95 | 90 |
| + | + | + |
| 91 | 86 | 88 |
| + | + | + |
| 83 | 87 | 88 |
| + | + | + |
| 83 | 85 | 89 |

13/02/2023 — 29th Floor

Kb - nb / lob — direct

PL = 230 mm

+56 + 59 + 61 + 61 + 61



13/02/2023

Tower (B) 8th Floor

Plot NO (802)

Beam → cb / 2b-3b (Direct)

+ 90 + 90 + 85 + 83 + 87 + 87

PL = 270mm

Column → 2b / Ab (Indirect)

| | |
|---|---|
| + 141 | + 144 |
| + 145 | + 148 |
| + 140 | + 138 |

P2 = 300 mm

Column → 2b / cb (Semidirect)

| |
|---|
| + 76 |
| + 76 |
| + 72 |
| + 73 |
| + 73 |

150 × 150

cover = 52 - 68mm

Slab :- 3b-2b / Cb-Bb

| | | |
|---|---|---|
| 34 | 34 | 34 |
| 32 | 38 | 34 |
| 38 | 36 | 36 |

RHT

Slab → 1b-2b / Ab-Bb

| | | |
|---|---|---|
| 32 | 32 | 38 |
| 38 | 34 | 36 |
| 36 | 38 | 34 |

RHT

Column → 3b / Cb (Semidirect)

| |
|---|
| +82 |
| +80 |
| +76 |
| +83 |
| +75 |

150 × 150

Tower B 29th floor 13/02/2023

Beam → 4b/Kb-Hb-Gb (Direct)

PL = 340mm

+78 +79 +78 +82+79

+84 + 86 + 82 + 80 +82 +80

Beam → Hb-Gb/4b-9b (Direct)

+85 +87+ 85+82+81 + 81 + 81

+84 + 82 + 86 + 85

PL = 330 mm

Column → 5b-6b/Kb (Direct)

.52 +159
152 +158
157 +165
149 +149
152 +154
147 + 152
149 +154
158 +155
154 +151
151 +147

PL = 640mm

Beam → 4b/Hb-Eb (Direct)

+74+75+77+76+74+82+87+85

PL = 330mm

Beam → Fb-Cb/4b (Direct)

+83 +82 + 82+85 +81 +85 + 85+84+83+85+86

PL = 330mm

Column → 8b-9b/Cb (Direct)

164 + 168
166 + 171
168 + 167
161 + 161
172 +174
177 + 172
174 + 178
176 +172
191 + 189

PL = 690mm

Cover = 40 - 62mm

Beam → 5b-8b/Cb (Direct)

+63+62+61+61+60+59 +62+63

PL = 240mm

748

13/02/2023

Beam = 3b/4b-Kb (Direct)

+57 + 59 + 63 + 63 + 60 +

PL = 240mm

Tank wall = 2b-4b/2b-(Hb-Gb) Indirect)

PL = 300mm

+138 +101 +113 +108 + 71 +83 + 96 + 109 + 172
+ 116 + 169 + 122 + 67 + 98 +112 + 98 +137 + 99
+ 177 + 79 + 90 + 71 + 86 + 84 + 98 + 98 + 143

water tank wall (Sidewall)

water tank wall (Sidewall)

+146 + 115 + 91 +96 +90 + 108 +111 + 121 +123 +146 +132 +134
+ 106 + 99 + 82 + 78 +91 + 97 +72 + 129 +103 + 106 +136 +136
+149 + 80 + 86 + 85 + 96 +84 + 82 + 76 + 72 + 75 + 88 + 90

Column → 3b-9b/Fb-Eb (Indirect)

+88 +93 +132 +98 +92 +
+85 + 106 +104 +93 + 149 +
+98 +103 + 109 +109 + 108
+130 +182 + 97 +167 + 109
+89 +98 + 104 +104 + 104
+ 101 +104 + 94 +93 + 109
+100 +91 +90 + 100 +90
+95 +96 +95+ 93 + 88
+99 +95 +91 + 108 +91
+ 93 + 104 +91 + 129 +122
+115 + 86 + 88 + 102 + 80

P2 = 300mm

Cover = 77 - 82 mm

Column = 5b / Cb

Cover = 44 - 57 mm

75

13/02/2023

slamm → 2b-4b / H6-G6

+106 + 98 + 99 + 97 + 94 + 98
+95 + 92 + 91 + 96 + 98 + 99
+103 + 91 + 88 + 86 + 89 + 98
+97 + 96 + 93 + 98 + 95 + 96
+96 + 101 + 109 + 108 + 109 + 101
+98 + 91 + 91 + 95 + 95 + 98
+85 + 91 + 89 + 87 + 92 + 94
+93 + 87 + 91 + 91 + 98 + 91
+84 + 94 + 92 + 88 + 96 + 92
+92 + 90 + 109 + 90 + 85 + 92
+83 + 85 + 81 + 86 + 92 + 89

P2 = 300 mm



13/02/2023

Tower B 28th Floor

Column → ~~2b~~ 2b-4b/

Beam → 3b-4b / G6-H6 (xb)

Direct

+62 + 63 + 59 + 59 + 58 + 57 + 58 + 58 + 58 + 56 + 56

P2 = 240mm

Column → 2b-4b / H6-G6 (Direct)

+98 + 89 + 84 + 86 + 85
+90 + 90 + 89 + 89 + 88
+86 + 84 + 84 + 87 + 85
+86 + 88 + 88 + 86 + 84
+88 + 88 + 87 + 86 + 89
+87 + 86 + 89 + 85 + 85
+87 + 86 + 84 + 85 + 89
+80 + 85 + 87 + 80 + 87

Cover = 46-50mm

P2 =

Column → K6 / 2b (Semi direct)

+49
+54
+60
+65
+64
+57
+70
+66

150 × 150

Beam → 8b-4b / E6-P6-H6-G6

+79 + 60 + 61 + 63 + 66 + 64 + 62 + 62

P2 = 240mm

Cover = 34-40mm

28th Floor. 18/02/2023

Beam → 3b-4b / Cb (Direct)

+58 + 57 + 57 + 56 +

PL = 230mm

Cover = 34-40mm

Column → 5b / Cb (Direct)

| | |
|---|---|
| + 157 | + 165 |
| + 156 | + 163 |
| + 157 | + 157 |
| + 164 | + 158 |
| + 155 | + 158 |
| + 157 | + 155 |
| + 153 | + 156 |
| + 160 | + 148 |

PL = 650mm

Cover = 48-50mm

Beam → ~~Cb-Bb/8b-9b~~ Cb-Bb/8b-9b

+65 + 64 + 67 + 69 + 67 Direct

PL = 230mm

Beam → Db-Cb/8b-9b

+68 + 66 + 63 + 66 + 65 + 64

PL = 250mm

Cover = 33-45mm

Beam → Fb-Eb/8b-10b

+63 + 71 + 68 + 70 + 76

PL = 250mm

Cover = 35-40mm



18/02/2023

Beam → Kb-Jb / 8b-9b (Direct)

+68 + 70 + 69 + 70 + 73 + 67 + 70

PL = 250mm

Slab → Db-Cb / 8b-10b (Indirect)

Cover = 39-46mm

| | |
|---|---|
| +76 | + 70 |
| +69 | + 72 |
| +77 | + 70 |

PL = 300mm

| | | |
|---|---|---|
| 30 | 30 | 30 |
| 36 | 34 | 32 |
| 36 | 36 | 34 |

RHT

Slab → Cb-Bb / 5b-6b

PL = 300mm

| | |
|---|---|
| +83 | + 78 |
| + 69 | + 62 |
| + 64 | + 72 |

(Indirect)

| | | |
|---|---|---|
| 34 | 32 | 36 |
| 36 | 28 | 28 |
| 30 | 36 | 34 |

RHT

14/02/2023

Tower B 27th Floor.

Beam → 3b-4b/4b (Direct)

+71 +72 +72 +71 +73 +70 +69 +68 +68 +73
+64 +71 +62 +67 +64 +64 +62 +66 +66 +65

PL = 250mm
cover = 46-88 mm

Column → 3b/2b (Direct) Cover = 36-101 mm

+100 +99 +101
+98 +95 +82
+84 +87 +89
+87 +82 +84
+76 +97 +80
+98 +94 +93
+89 +95 +98

PL = 310mm

Beam → 2b-1b/2b (Direct

~~+85 +80 +88 +93 +98 +97 +86~~
~~+95 +97 +79 +88 +91 +79 +59~~

PL = 260mm

59 +65 +66 +62 +60 +65 +68 +66 +70 +64 +72 +60
57 +68 +62 +68 +67 +62 +70 +68 +69 +72 +57 +59

The Measurements on this page were taken on .....



Tower B 27th Floor. 14/02/2023

Beam → 2b/1b-2b (Direct) PL = 260mm

Cover PL = 260mm

+62 +60 +59 +61 +63 +63 +64 +38 +64 +64 +65 +64 +62
+56 +60 +60 +59 +70 +59 +62 +62 +62 +61 +64 +62 +64

+65 +72 +
+63 +62

Column → 2b/1b (Direct)

+109 +116
+115 +130
+115 +116
+120 +114
+118 +114
+105 +106

PL = 450mm

Column → 2b/2b (Direct)

PL = 710 mm

+285 +250
+250 +200
+194 +201
+202 +261
+198 +198
+206 +216
+202 +212

The Measurements on this page were taken on .....

Tower (B) 27th Floor 14/02/2023

Column → 8b-9b / Kb (Semidirect)

| | |
|---|---|
| +63 | +182 |
| +76 | +204 |
| +75 | +300 |
| +54 | +214 |
| +54 | +175 |
| +50 | +181 |
| +54 | +137 |

Cover = 48 × 56 mm

Duct top slab (Indirect)

| | |
|---|---|
| +272 | +222 |
| +221 | +162 |
| +265 | +228 |
| +232 | +229 |

P2 = 300mm

Column → 2b/Eb-6b

Cover = 58 - 62 mm

| | |
|---|---|
| +121 | +115 |
| +148 | +154 |
| +135 | +143 |
| +144 | +142 |

P2 = 460mm

The Measurements on this page were taken on 14/2



Tower (B) 27th Floor 14/02/2023

Beam → 6b-6b / 8b-9b (2b) (Direct)

+78 +82 +84 +93 +78 +74 +71 +71 +70 +75 +76 +71
+86 +79 +93 +75 +76 +72 +71 +93 +73 +75 +74 +69

P2 = 250mm

Column → 5b-6b / 8b-9b (2b)

Re Column → 8b-9b / Kb (Direct)

| | |
|---|---|
| +101 | +116 |
| +165 | +98 |
| +93 | +97 |
| +101 | +98 |
| +95 | +97 |
| +96 | +92 |
| +96 | +98 |

P2 = 350mm

Cover = 62 - 66 mm

Beam → 8b-9b (10b) / Kb (Direct)

+80 +70 +71 +67 +69 +66 +70
+74 +76 +68 +66 +66 +66 +64

P2 = 250mm

Column → Kb / Lb (Direct)

| | |
|---|---|
| +166 | +164 |
| +126 | +132 |
| +127 | +126 |
| +126 | +126 |
| +126 | +130 |
| +116 | +128 |
| +135 | +148 |
| +131 | +130 |

Cover = 74 - 86 mm

P2 = 470mm

The Measurements on this page were taken on 14/2

Tower. B 27th Floor 14/02/2023

Beam → 2b-kb/4b (Direct)

~~+75 +66 +64 +66 +66 +88~~

+75 +64 +66 +68 +69 +68 +70 +84 +70 +69 +76 +64
+66 +66 +68 +71 +78 +69 +70 +70 +71 +74 +68 +67

PL = 240mm

Cover = 32-55 mm

~~Column → Ub/kb (Correct)~~ ~~(Column → Ub/kb (Correct))~~

Beam → 11b-12b/2b (Direct)

+91 +94 +62 +67 +64 +63 +60 +58 +64 +61 +64 +66 +66 +65
+94 +63 +67 +63 +63 +63 +61 +61 +63 +63 +66 +67 +70 +67

PL = 250mm

umn → 4b/Lb (Direct)

+206 +220
+330 +329
+205 +204
+201 +216
+211 +182
+185 +198
+170 +166
+164 +164

PL = 710mm

Column → 4b/kb halfcell

+289, +282, -294, -280, -320
-300, -303, -319, -291

halfcell

The measurements on this page were taken on ..... (84)

Tower B 27th Floor 14/02/2023

Beam → 8b-9b/10b—Bb (Direct) Column → 8b-9b/cb

PL = 270mm

+69 +68 +78 +71 +74 +74 +68 +73
+62 +63 +64 +59 +60 +58 +65 +67

Semidirect

+77 +192
+68 +195
+71 +188
+70 +188
+74 +180
+75 +180

column → 10b/Bb (Direct)

PL = 310mm

+80 +76
+80 +81
+84 +80
+81 +83
+84 +80
+81 +83
+81 +78

Column → Cb/11b (Direct)

PL = 460mm

+117 +117
+120 +118
+121 +120
+110 +117
+117 +121
+120 +121
+116 +114

Beam → 10b/Bb-Cb (Direct)

PL = 240mm

+55 +52 +58 +61 +58 +57 +60
+54 +59 +58 +58 +60 +54 +54

+58 +61 +57
+59 +60 +56

Column → 11b/Ab (Direct)

+213
+191
+199
+184
+182

PL = 840mm

PL = 840mm

The Measurements on this page were taken on ..... (85)

Tower B 27th Floor 14/02/2023

Column → 12b / Bb (Direct)

PL = 430mm.

| | |
|---|---|
| +105 | +102 |
| +102 | +103 |
| +114 | +128 |
| +116 | +141 |
| +102 | +112 |
| +109 | +106 |

Beam → Cb-Bb / 12b (Direct)

PL = 240mm

| | | | | |
|---|---|---|---|---|
| +56 | +57 | +56 | +56 | +56 |
| +58 | +57 | +57 | +57 | +57 |

halfcell = 10b-11b / Bb

-270 -283, -290, -280, -298, -300, -302

-300, -310, -293.

HALF CELL

Beam → 10b-11b / Ab-Bb (Direct)

| | | | | | | |
|---|---|---|---|---|---|---|
| +57 | +56 | +59 | +57 | +58 | +62 | +60 |
| +58 | +58 | +62 | +62 | +56 | +58 | +60 |

PL = 240mm

Remarks:

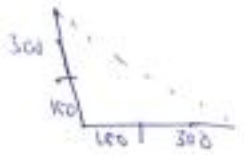
The Measurements on this page were taken on 14/2

(86)

Tower B 27th Floor 14/02/2023

Column → Cb / 5b-6b (Semi direct)

| | |
|---|---|
| +152 | +149 |
| +155 | +157 |
| +151 | +152 |
| +144 | +158 |
| +155 | +157 |
| +149 | +155 |
| +150 | +138 |
| +146 | +149 |




Beam → 3b-5b(6b) / Bb

| | | | | | | |
|---|---|---|---|---|---|---|
| +65 | +63 | +59 | +61 | +59 | +57 | +58 |
| +67 | +61 | +60 | +59 | +59 | +61 | +56 |

| | | | | |
|---|---|---|---|---|
| +56 | +55 | +58 | +55 | +55 |
| +58 | +56 | +53 | +55 | +53 |

PL = 240mm.

Column → 3b / Bb (Direct)

| | | |
|---|---|---|
| +74 | +79 | +81 |
| +78 | +79 | +82 |
| +76 | +76 | +88 |
| +79 | +77 | +81 |
| +79 | +79 | +77 |
| +79 | +81 | +80 |
| +71 | +76 | +73 |
| +74 | +67 | +75 |

PL = 300mm

The Measurements on this page were taken on 14/2

(87)

Tower B 27th Floor 14/02/2023

Column → C6/2b (Direct)

PL = 460 mm

| | |
|---|---|
| +109 | +115 |
| +114 | +114 |
| +116 | +121 |
| +117 | +120 |
| +118 | +120 |
| +106 | +117 |
| +112 | +124 |

Column → B6/1b (Direct)

PL = 450 mm

| | |
|---|---|
| +105 | +105 |
| +102 | +110 |
| +109 | +124 |
| +112 | +105 |
| +106 | +115 |
| +105 | +101 |
| +104 | +106 |

Column → 2b/A6 (Direct)

PL = 830 mm

| |
|---|
| +212 |
| +208 |
| +196 |
| +201 |
| +201 |

Beam → B6/1b-2b (Direct)

PL = 250 mm

+63 +64 +61 +63 +59 +57 +59 +62
+64 +62 +63 +63 +60 +58 +58 +57

+57 +59 +60 +58 +60 +55 +54
+57 +58 +58 +58 +55 +61 +61

Beam → 2b/A6-B6 (Direct)

+55 +53 +53 +53 +60 +59 +61 +58 +
+57 +58 +55 +57 +57 +60 +63 +60

PL =

The Measurements on this page were taken on 14/2



Tower B 27th Floor 14/02/2023

Beam → 2b-3b/C6 (Direct)

+61 +62 +64 +66 +62 +66 +66 +68
+64 +62 +63 +63 +62 +61 +62 +67

PL = 240 mm

Slab → 5b-6b(7b)/3b-4b (Indirect)

| | |
|---|---|
| +108 | +147 |
| +127 | +132 |
| +117 | +167 |
| +88 | +133 |

PL = 300 mm

| | | |
|---|---|---|
| 38 | 36 | 36 |
| 32 | 32 | 40 |
| 40 | 38 | 38 |

RHT

Beam → 4b/3b-4b (Direct)

+61 +62 +62 +63 +78

PL = 240 mm

Slab → 4b-H6/5b/2b-4b (Indirect)

| | | |
|---|---|---|
| +137 | +121 | +106 |
| +109 | +83 | +99 |
| +96 | +98 | +109 |
| +109 | +102 | +152 |

PL = 300 mm

Cover = 42-48 mm

| | | |
|---|---|---|
| 34 | 34 | 38 |
| 36 | 38 | 26 |
| 34 | 34 | 26 |

RHT

The Measurements on this page were taken on 14/2

06/02/2023 = 701
1204
1303
1301
1302
1404
1402
1401
1304
1502
} 10 flats

Common Area — (2)
15th Floor & 16th Floor
& 17th Floor.

07/02/2023
1403
1503
1504
1801
1604
1601
1701
1703
1704
1903
1104
} 11 flats

Common Area — (3)
18th 19th & 20th Floor

08/02/2023 = 1902
2001
1904
2002
2004
2102
2202
2204
2302
2301
} 10 flats

Common area = (4)
(21) (24) (25) (26)

09/02/2023 = 2501
2503
2502
2602
2601
2604
2101
2104
2404
2304
2003
} 11 flats

Common Area — 2 Floor
flat 21st & 22nd.

3/02/2023

802 → Flat 1

Floors = 20th, 28th completed.

4/02/2023

0404
2103
2203
2303
1901

} 5 flats

(common area - Below Helipad Testing)

0404
505 804

11th Floor = 1102, 1103

12th Floor = 1202

13th Floor = 1301, 1302, 1303, 1304 completed

14th Floor = completed

15th Floor = completed

16th Floor = 1602, 1603 completed

17th Floor = 1702 completed

18th Floor = 1801, 1802, 1803, 1804

19th Floor = 1904, 1901 completed

20th Floor = 2001, 2002, 2003, 2004 complete

21st Floor = 2101, 2103, 2103, 2104 completed

22nd Floor = 2201, 2202, 2203, 2204 completed

23rd Floor = 2301, 2302, 2303, 2304 completed

24th Floor = 2401, 2402, 2403, 2404

25th Floor = 2501, 2502, 2503, 2504

26th Floor = 2601, 2602, 2603, 2604.

29th Floor - Tower 'C'

14-02-2023

Proforma - cover.

Beam -

Column - LC/5C

cover - 40 to 45 mm

column — KC/10C

45 to 52 mm

Column — HC/10C-11C

48 to 56 mm

Column — CC/3C

40 to 45 mm

Column - BC/5C

46 to 54 mm

Column - BC/10C

47 to 55 mm

Slab — EC-CC/10C-11C

~~30 to~~ 22 to 30 mm

Beam — EC-CC/10C

30 to 38 mm

Beam - HC-~~CC~~/9C-10C

42 to 52 mm.

Slab - HC-EC/9C-10C

25 to 30 mm.

Slab. KC-HC/9C-10C

| | | |
|---|---|---|
| 32 | 30 | 34 |
| 32 | 34 | 32 |
| 32 | 30 | 34 |

Slab CC-BC/5C-8C

23 to 30 mm

Beam — BCC/6C-9C

36 to 48 mm

The Measurements on this page were taken on .....



29th Floor

14/02/2023

Slab - EC-CC/3C-4C

| | | |
|---|---|---|
| 32 | 34 | 32 |
| 36 | 34 | 32 |
| 34 | 32 | 30 |

Column - EC/10C (91-360)

Shearwall

+112 +110 +106

+100 +102 +103

+103 +101 +105

+101 +101 +99

+100 +97 +98

+104 +103 +104

+116 +102 +112

+109 +109 +108

+110 +109 +105

+120 +121 +120

+124 +128 +120

Slab - KC-LC/5C-8C

| | | |
|---|---|---|
| 28 | 32 | 30 |
| 32 | 30 | 30 |
| 28 | 32 | 30 |

Column - HC/10C (91-390)

+124 +126 +122

+125 +123 +124

+126 +117 +118

+119 +118 +114

+112 +116 +118

+122 +116 +114

+113 +113 +114

+114 +120 +116

+116 +118 +113

+119 +119 +114.

The Measurements on this page were taken on 14/2

folder - C

29th Floor

14-02-2023

column - CC/9C (660)

+173 +160
+164 +166
+165 +164
+162 +164
+160 +162
+164 +160
+168 +154
+152 +164
+163 +167
+166 +162
+164 +161
+163 +162

column - BC/6C (150x150)

Semidirect
+82
+57
+60
+61
+58
+58
+62
+64
+61

column. ~~AC/9C~~ BC/9C (150X150)

(Semidirect)

+56
+54
+56
+58
+55
+61
+60
+57
+56
+57
+54
+56

150

The Measurements on this page were taken on 14/2

29th Floor Tower - C

14-02-2023

column - CC/6C (P1-630)

+164 +162
+161 +150
+160 +162
+161 +163
+165 +160
+169 +164
+164 +154
+150 +150
+162 +164
+158 +153
+152 +154
+164 +156

column - KC/8C (P1-640)

+160 +176
+174 +172
+174 +171
+171 +173
+177 +180
+176 +176
+169 +173

column - KC/5C (P1-640)

+174 +175
+175 +171
+174 +168
+164 +169
+167 +181
+164 +168
+163 +174
+168 +165

The Measurements on this page were taken on 14/2

29th Floor 14-02-2023

Column - 2C/5C

Semidirect) 1st

(150x150)

+54 +52

-52 +53

54 +54

52 +57

54 +56

52+ 52

51 +53

Beam - CC/5C-9C (PL-230)

+67 +70 +64 +66 +69

Beam - CC/9C-10C (P1-230)

+69 +67 +66 +65 +67 +63 +64 +61

Beam - CC/3C-5C (P1-230)

+68 +72 +70 +70 +69 +72 +73 +64 +64

Slab - EC-HC/9C-10C (300)

+ 82 + 84 + 82 +79 +71 +

+ 73 + 78 + 75 + 69 + 71 +

+ 63 + 76 + 74 + 68 + 70 +

+ 81 + 75 + 67 + 63 + 69 +

+ 80 + 66 + 84 + 83 + 81 +

+ 68 + 73 + 74 + 71 + 66 +

mm - KC-JC/7C (230)

+63 +60 +61 +64 +62

The Measurements on this page were taken on 14/2

5

C-Tower 22nd Floor 14-02-2023

# C-2204

- UPVT

Column - HC-11C (100x100)

(Semidirect)

+34 +30 +28 +29

Beam - KC-JC/10C-11C (240)

+63 +66 +66 +65

Slab - 2C-KC/8C-10C (300)

(Semidirect)

+65 +70 +68 +63

Slab - 2C-MC/10C-11C

| | | |
|---|---|---|
| 42 | 38 | 40 |
| 38 | 42 | 38 |
| 40 | 38 | 38 |

RHT

Projections

Column - 2C/11C

cover - 39 to 50 mm

Beams - MC-2C/11C

38 to 42 mm

Slab - MC-2C/10C-11C

26 to 32 mm.

Slab - HC-KC/11C-12C

| | | |
|---|---|---|
| 42 | 38 | 36 |
| 34 | 38 | 40 |
| 42 | 40 | 38 |

RHT

The Measurements on this page were taken on 14/2

6

29th Floor

14-02-2023

Slab – BC-CC/11C-12C (P1-300) (Endwise)

+72 +75 +78 +81 +68 +

+73 +79 +78 +81 +65 +

+80 +80 +77 +75 +73 +

+74 +72 +72 +84 +69 +

+73 +69 +63 +83 +61 +

+77 +74 +80 +84 +79 +

KL-11/5C-8C (300)

Slab. BC-CC/11C-12C (Endwise) (300)

+79 +80 +81 +80 +78 +

+79 +80 +78 +79 +78 +

+81 +76 +79 +82 +81 +

+74 +78 +72 +80 +82 +

+73 +85 +81 +84 +79 +

+80 +82 +77 +80 +78 +

Beam – KC-HC/6C (P1 – 340)

+87 +90 +85 +91 +89 +90 +88 +90 +86 +85 +84 +81 +87

Beam – EC-HC/6C (340)

+87 +86 +84 +89 +85 +83 +80 +80 +85 +81

The Measurements on this page were taken on 14/2

(7)

29th Floor

14-02-2023

Beam – EC-CC/6C (P1-340)

+82 +81 +90 +87 +82 +80 +81 +86 +83 +90 +93

Beam – HC/9C-10C (350)

+97 +98 +96 +94 +93 +98 +99 +94 +90 +94

Beam – HC/5C-9C (350)

+91 +96 +95 +96 +93 +98 +96 +93 +95 +94

Beam – KC/9C-5C (P1-340)

+78 +76 +77 +80 +82 +81

The Measurements on this page were taken on 14/2

(8)

15th Floor

15-02-2023

C-1502 UPVT

Column – CC/2C (150x150)

(Semi dirict)

+64 +68 +54 +58

Beam – CC/2C-3C

+78 +76 +80 +74

Slab – AC-BC/1C-2C (300)

+68 +72 +70 +71

Slab – BC-CC/1C-2C

| | | |
|---|---|---|
| 30 | 28 | 30 |
| 32 | 30 | 28 |
| 30 | 28 | 30 |

Proformeter cover

Column – CC/3C

32 to 46mm.

Beam – BC/2C-3C

34 to 42 mm.

Slab – CC/2C-3C

25 to 30mm.

Slab – AC-BC/1C-2C

| | | |
|---|---|---|
| 30 | 32 | 28 |
| 30 | 28 | 30 |
| 28 | 30 | 28 |

The measurements on this page were taken on 15th



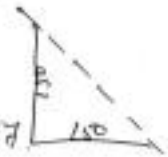
Tower-C 19th Floor

15-02-2023

# C-1901 UPVT

Column – CC/11C (150x150)

(Semidirict)




+56 +58 +57 +57

Beam – CC/11C-12C (260)

+78 +75 +77 +74

Slab – BC-CC/9C-10C (300)

(Indirict)

+90 +86 +85 +83

Slab – CC-BC/10C-11C

| | | |
|---|---|---|
| 36 | 34 | 32 |
| 32 | 36 | 34 |
| 34 | 32 | 36 |

Column – CC/8C (Pl-150x150)

(Semidirict)

+74 +75 +71-72

Proformeter

Column – CC/9C

35 to 44 mm

Beam – AC/10C-11C

30 to 40 mm.

Slab – AC-BC/11C-12C

24 to 30 mm.

Slab – BC-CC/11C-12C

| | | |
|---|---|---|
| 36 | 40 | 38 |
| 30 | 32 | 32 |
| 34 | 36 | 34 |

The Measurements on this page were taken on 15th

Tower-C

27th Floor

15-02-2023

Column - Cc/2c (Pl )

+180 +178

+191 +190

+182 +180

+183 +181

+181 +170

+180 +183

+178 +181

+180 +

171 173

-340)

column - Bc/2c (720)

(Pl -

+174 +180 +182

+174 +180 +181

+179 +181 +180

+136 +181 +180

+174 +177 +160

+165 +174 +174

+173 +170 +176

+174 +176 +172

+166 +164 +173

(Pl - 720)

Col - cc - 3c (Pl - 340)

+92 +96 +89

+100 +98 +97

+101 +104 +105

+104 +101 +96

+100 +102 +100

+94 +97 +100

+94 +91 +91

+92 +87 +90

+88 +86 +87

The measurements on this page were taken on ....15/2....

Je

11

27th Floor

15/2/2023

Column - Bc/3c (Pl - 380)

+83 +84 +83

+91 +90 +89

+90 +91 +91

+93 +95 +87

+97 +96 +93

+85 +98 +96

+86 +95 +96

+87 +96 +98

+86 +90 +91

Col - Bc/6c (300)

+73 +78 +

+86 +84 +

+84 +81 +

+82 +74 +

+76 +75 +

Inclined ↑

Column - cc/5c (Pl-670)

+164 +166

+180 +182

+192 +181

+191 +186

+192 +194

+191 +193

+194 +196

+198 +199

Parameter

column - Ac-1c

36 to 48 mm

Beam - Bc-cc/2c

30 to 42 mm

The measurements on this page were taken on ....15/2....

Je

12

Tower - C  27th Floor  15-02-2023

Column Ac/2c (

+73 +80 +
+74 +81 +
+82 +83 +
+84 +80 +
+73 +69 +
+71 +69 +
—

column - Cc/1c (300)

+78 +
+76 +
+ 82 +
+72 +
+74 +
+75 +
+76 +
+83 +

Indirect

col - Ac/2c (300)

+81 +82 +
+78 +81 +
+74 +80 +
+76 +80 +
+76 +68 +
+77 +75 +
(Indirect.)

The Measurements on this page were taken on 15/2



Tower - C  27th Floor  15/02/2023

Column Kc/10c (PL-360) (D)

+100 +101 +103
+107 +105 +108
+108 +111 +107
+107 +102 +108
+97 +105 +100
+101 +99 +101
+95 +101 +103

Column Lc/10c (PL-350) (D)

+109 +102 +107
+104 +108 +111
+98 +99 +95
+98 +98 +96
+96 +98 +91
+93 +98 +93
+93 +89 +86

Column Lc/11c (PL-730) (D)

+195 +182 +183
+205 +194 +191
+200 +192 +195
+193 +189 +184
+205 +187 +176
+175 +184 +178
+178 +178 +176
+168 +167 +166

Column Kc/11c (PL-740) (D)

+195 +212 +192
+205 +195 +198
+192 +190 +187
+196 +188 +182
+194 +185 +
+176 +182 +189
+174 +176 +186

The Measurements on this page were taken on 15/2

Tower-C 27th Floor 15/02/2023

Beam Kc/10c-11c (PL-240) (T)

71 65 + 61 + 59 + 59 + 59 + 63 + 62 + 56 + 56 + 58 + 63 + 60 + 59 + 63

: + 63 + 65 + 63 + 65 + 63 + 66 + 65 + 65 + 62 + 64 + 62 + 61 + 63 + 58

Beam Kc-Lc/10c (PL-240) (T)

58 + 56 + 58 + 58 + 56 + 58 + 63 + 64 + 56 + 60 #

64 + 64 + 62 + 63 + 58 + 66 + 64 + 58 + 61 + 61 #

Beam Lc/10c-11c (PL-240) (T)

55 + 57 + 56 + 56 + 63 + 61 + 61 + 62 + 61 + 63 + 66 + 64 + 69

56 + 58 + 59 + 57 + 63 + 65 + 63 + 70 + 65 + 65 + 64 + 66 + 65

Beam Lc-Mc/11c (PL-230) (T)

+56 + 59 + 55 + 58 + 54 + 54 + 57 + 55 + 55 + 52 + 53 + 52 + 52 + 54

+55 + 57 + 59 + 56 + 56 + 57 + 57 + 57 + 57 + 54 + 55 + 54 + 56 + 54

The Measurements on this page were taken on 15/2

JE

15

Tower-C 27th Floor 16/02/2023

Column Kc/6c (PL-670) (T)

| # | # |
|---|---|
| +190 | +185 |
| +187 | +189 |
| +183 | +190 |
| +187 | +183 |
| +186 | +189 |
| +188 | +190 |
| +183 | +189 |

Column Kc/2c (PL-760) (T)

Column Lc/2c (PL-750) (T)

+205 + 206 + 201

+206 + 197 + 206

+192 + 196 + 192

+194 + 200 + 199

+178 + 195 + 191

+176 + 192 + 198

+177 + 183 + 185

Column Lc/3c (PL-350) (T)

| | | |
|---|---|---|
| +88 | +91 | +87 |
| +94 | +96 | +91 |
| +95 | +100 | +100 |
| +101 | +102 | +106 |
| +93 | +102 | +106 |
| +99 | +104 | +100 |
| +102 | +102 | +106 |
| +98 | +108 | +111 |
| +91 | +98 | +94 |

JE

The Measurements on this page were taken on 16/2

16

wer-C 27th Floor 16/02/2023

eam Kc-Lc/6c (PL-240) (P)

83 +77 +80 +79 +78 +80 +83 +85 +79 +84

eam Kc-Lc/3c (PL-240) (P)

+64 +60+58 +57+58 +59 +58 +55 +57+60 +62

-63 +66 +62 +63+58 +58 +59 +60+57+62+58

m ~~Lc/4c~~ Lc-Mc/2c (PL-240) (P)

3+63+71+65+61+57+59+60+60+59+60+59+61+59+60

:+66+65+64+57+58+57+56+57+58+60+57+56+62+56

m Lc/1c-2c (PL-240) (P)

60+61+59+59+60+59+62+61+60+57+57+59+59+60

57+55+56+58+59+61+58+60+58+56+57+61+58+59

The Measurements on this page were taken on .....

17

Tower-C 27th Floor 16/02/2023

Beam Cc/2c-3c (PL-240) (P)

+62 +69 +67 +66 +63 +60 +56 +60 +65 +64

Beam Bc-Cc/3c (PL-240) (P)

+63 +62 +62 +59 +59 +67 +64 +63 +62 +61

+62 +60 +59 +60 +58 +60 +60 +61 +58 +61

Beam Bc/3c-6c (PL-240) (P)

+54 +60 +61 +66 +70 +66 +67 +67 +67 +66 +66

+55 +56 +58 +61 +67 +68 +68 +66 +64 +68+68

Beam Ac-Bc/2c (PL-230) (P)

+62 +63 +63 +61 +56 +57 +60 +64 +60+61+65

The Measurements on this page were taken on .....

18

Lumn Cc/10c (PL-340) (P)

+95 +95 +99
+92 +94 +100
+89 +97 +98
+98 +95 +98
+92 +93 +94
+92 +89 +93
+89 +88 +87
+82 +83 +86

Column Bc/10c (PL-360) (P)

+100 +104 +98
+102 +100 +100
+100 +104 +99
+105 +104 +108
+96 +105 +104
+98 +101 +107
+107 +104 +104

Column Bc/11c (PL-740) (P)

+181 +183 +182
+178 +181 +178
+185 +182 +182
+187 +183 +186
+185 +182 +184
+179 +183 +178
+177 +176 +171
+168 +169 +168

Column Cc/11c (PL-750) (P)

+184 +183
+184 +181
+179 +183
+185 +179
+185 +180
+185 +180
+182 +177
+182 +183

The Measurements on this page were taken on .....





Beam Bc-Cc/10c (PL-250) (P)

+73 +75 +76 +74 +72 +71 +70 +72 +73
+75 +72 +71 +75 +74 +74 +64 +68 +70

Beam Bc/10c-11c (PL-280) (P)

+80 +83 +83 +70 +64 +63 +61 +68 +59 +59 +67
+75 +82 +82 +62 +61 +62 +68 +62 +63 +60 +60

Beam Ac-Bc/11c (PL-250) (P)

+64 +64 +65 +62 +62 +61 +59 +62 +60 +60
+62 +64 +63 +64 +60 +63 +61 +62 +65 +62
+69 +69 +66 +61 +62
+70 +72 +67 +63 +58

The Measurements on this page were taken on .....

Tower-C

18/02/2023

9th Floor Shear Wall Ec/10c-11c

-340 -259 -260
-315 -367 -316
-285 -290 -328

13th Floor Staircase Waist Slab

-280 -320 -310
-317 -297 -286.

15th Floor Fire Staircase Waist Slab

The Measurements on this page were taken on .....

18/02/2023

OPUT

~~9th Floor Shear Wall F6/10-Hc (PL 300x300 without Plaster~~

9th Floor Beam Jc-Hc/3c-4c (PL-230) (D) Common Area

With Plaster

65 + 66 + 70 + 68 + 72

Without Plaster (PL-210)

+52 +49 +49

4th Floor Column Cc/6c (PL - 300x300) (FA)

with Plaster

+72 +67

+68 +96

The Measurements on this page were taken on ...../02/...

(23)

Tower C 20th Floor Common Area 21/02/2023

Beam → Hc/3c-4c

+59 +60 +60 +60 PL = 230mm

Tower C 17th Floor Common Area

Beam Hc/3c-4c

+67 +64 +67 PL = PL = 300mm

Tower C 16th Floor Common Area

Shear Wall → Hc/10c-11c

+83 +78 +74 PL = 300mm

Tower C 15th Floor Common Area;

column → cc/8c

+90
+83
+80
+80 PL = 300mm

Tower C 12th Floor Common Area

column → Hc/8c-cc/8c

+98
+97 PL = 300mm

The Measurements on this page were taken on ...21/2...

Tower C 7th Floor Common Area

Beam → Hc/10c-11c

| |
|---|
| +90 |
| +87 |
| +84 |

PL = 300 mm

Tower C 1st Floor Common Area

Beam → Ec/3c-4c

+60 +58 +56 PL = 220 mm

Tower C 2nd Floor Common Area.

Beam → Cc/6c

| |
|---|
| +77 |
| +76 |
| +70 |
| +72 |

PL = 300 mm

Tower C 2nd Floor Common Area

Column → 8c/Dc-Cc

+59 +59 +59 PL = 230 mm / ~~300 mm~~

The Measurements on this page were taken on .....

Tower - C 1803 21/02/23

Column Mc/2c (7m) 300

+90
+101
+93
+86
+96

Column Mc/3c (7m) 300

+93 +78
+86 +80
+72 +80

Column Kc/3c (7) 300

+117 +105 +133
+110 +94 +106
+123 +93 +93

Cover → 68 to 73

Column Kc/6c (SD)

| 150 | 300 |
|---|---|
| +61 | +129 |
| +70 | +154 |
| +68 | +141 |

Slab Kc/Lc - 2c/3c

RHT → 32 - 36

Slab Lc/Mc - 1c/2c

RHT → 28 - 34

Beam Kc/2c - 3c (7) 260

+75 +73 +74 +76 +78 +74

cover → 28 to 42

The Measurements on this page were taken on .....

28/01/2023

8138 0590 98 Baiju Gk.

10th F
3rd F

off Cell for Slab

TOWER-B

@ Eb - 12b/11b

Basement

Reciped

-338 -337 -318 9.5

-320 -350 -380

-355 -342 -338

off Cell Column TOWER-B Basement

-160 -139 -142 Reciped

-176 -186 -195 33

-233 -182 -174

Half Cell for column TOWER-B

Cb - 5b Basement

Reciped

(49)

-178 -173 -190

-187 -

off Cell for Beam 1b/11b/Eb

TOWER B - Basement

-210 -224 -211 Reciped

-233 -201 -221 46-54

-233 -212 -225

off Cell for Column Ce/5c

Tower-C Basement Resiped

-231 -304 -345 8-11

-389 -362 -380

-329 -376 -392

Half Cell for Label -3c/11c

@ Tower C Basement

-202 -185 -199 Reciped

-184 -181 -183 32/14

-205 -210 -201

Half Cell for Beam @ 9c-8c/11c

Tower-C Basement

Reciped

-195 -187 -196 50-60

-188 -186 -195

-190 -185 -191

Half Cell for Column @ 1c/5c

Tower-C Basement

Resiped

-160 -147 -135 66

-148 -133 -143

-147 -140 -155

Half Cell for Beam @ 1c/11c-Kc

Tower-C Basement

-145 -149 -145 Resiped

-139 -160 -175

-140 -160 -193

Half Cell for Column Cc/11c

Tower-C Basement

-208 -204 -185

-198 -195 -200

-201 -199 -170

papergrid®

Reflects You

TESTING DATA-(8)

*The more experiments you make, the better.*

| Sl. No. | Date | Title | Page No. | Teacher Sign/ Remarks |
|---|---|---|---|---|
| | | AWHO Towers Kochi. Kerala. | | |
| | 10/02/2023 | Tower B. (Lift Shear Walls) NDT. | | |
| | | → 5th Lift. from 26th floor to 19th floor | | |
| | | from 18th to -1 (Basement) | | |

NDT Lift (S) 26th floor (No distress) 14/02/2023

| | Grid. | RHT. | UPVT P(fm) Method |
|---|---|---|---|
| 1) | 7b-(6b-5b) | 24,26,28 / 24,24,26 | 96,92,97.2,93.1 / 93.6,88.1 -300 - Indirect |
| 2) | 6b(4b-7b) | 24,26,28,26 / 24,26, | 122.6,111.2 / 123.6,108 - 300 mm - " / 122.1,122.4 |

25th floor (No distress)

| | | | |
|---|---|---|---|
| 3) | 7b-(6b-5b) | 30,28,26,30. | 96.5,97.7,99.2 / 101.4,96.7,101.2 " - " |
| 4) | 6b(4b-7b) | 26,26,28,26. | 98,102,103.8 / 106,111,85. " - |

24th floor (No distress)

| | | | |
|---|---|---|---|
| 5) | 4b(6b-5b) | 32,30,30,30 | 96.1,98.6,96.8 / 128.2,116.9,126.2 " - " |
| 6) | 6b(4b-7b) | 32,30,32,30 | 98.6,96.2,96.8 / 96.3,98.7,95.6 |

23rd floor (No distress) " "

| | | | |
|---|---|---|---|
| 7) | 4b(6b-7b) | 20,24,22,22 / 24 | 103,101,106, / 96,89.9,104.2 " " |
| 8) | 6b(4b-7b) | 20,22,22,24 / 24 | |

22nd floor (No distress)

| | | | |
|---|---|---|---|
| 9) | 6b(4b-7b) | 86,90,91,96, | 30,30,28,30 " 28' (RHT) |
| 10) | 4b(6b-7b) | 87.6,89.7,90.2, / 86.6. | 20,26,24,26 " 26 (RHT) |

The Measurements on this page were taken on ...14/2...

Pg-01

14/02/23
M.

Grid. RHT, UPVT, PL,

Floor 22nd (Same as above direction)

11) 4b(6b-7b) 22, 26, 24, 26 - 122, 146.1, 130, 141, 136, 135.9 - 300 - ID

12) 6b(4b-7b) 26, 30, 28, 26 - 126, 116, 118, 122, 118, 118 - 11 - 11

Floor 20 (Same as above direction)

13) 4b(6b-7b) - 26, 22, 20, 24 - 135.6, 157, 142, 143, 152.3, 161.2, - 11 - 11

14) 6b(4b-7b) - 26, 24, 24, 24.

Floor 19th → Corrosion Crack (Spalling & Exposed of rebar)

15) 4b(6b-5b) - 24, 22, 28, 26 - 87.4, 80.7, 72.6, 80.3, 81.3, 80.6, -

16) 6b(4b-7b) - (Minor plaster Crack)

Half cell potential test

Reading (mV)

346, 337, 356, 369, 366, 374.

Prob (cover thickness) = thickness = 12 to 16mm

The Measurements on this page were taken on .....SMK.....

Pg-02

14/02/23

| Grid | RHT | UPVT All 300mm Pt & 2D method | Proto Thickness. |
|---|---|---|---|

## 18th floor (Corrosion Crack)

17) Gb(4b-7b) - 18,20,24,24 - ✗ 15 to 21.

18) 4b(6b-Jb) - Debanded - full ✗ 13 - 18

## 17th floor (Nodding)

13) 4b(6b-Jb) - 22, 26, 30, 24 - 103, 106, 104.2, 105.6, 107.8. - 13 - 20.

## 16th floor (Corrosion Cracks)

14) 4b(6b-5b) - 22, 26, 24, 26 - - 18 - 30

## 15th floor

15) 7b(6b-5b) → Corrosion cracks (Spalling plan)

16) 4b(6b-Jb) - 22, 24, 26, 24. - 18 - 26

## 14th floor

17) 6b(4b-7b) - 22, 24, 26, 28 - ✗ - 15 - 28

## 13th floor

18) 7b(4b-7b) - 24, 26, 28, 22 - ✗ 18 - 20

save gift as attachment

..... no reply

The Measurements on this page were taken on ..... 14/2

Pg-03

Grid RHT UPVT Profn.

## 12th floor (Corrosion Cracks)

19) Gb(Gb-Jb) 24,26, - 85, 94.9, 85.1, - 18-26.
24,26. 136.1, 79.2, 96.6.
28.

20) Gb(Gb-Jb) - 26,24,28,26 86, 88.8, 91 — 20-26
89.1, 96.1

## 11th floor (Corrosion Cracks)

21) Gb(Gb-Jb) - 26,22,24 - — 20-28
24,26

## 10th floor (Cor

22) Gb(Gb-Jb) 22,24,26 — — 18-25
24,26

## 9th floor (Corrosion Cracks)

23) Gb(Gb-Jb) - 22,26,24 - 108.5, 102.9, - 15-30
24,28,24 103.5, 113,
109, 108.

## 8th floor (

24) Gb(Gb-Jb) : (Corrosion cracks, Carbonation pink color stains.

The Measurements on this page were taken on ..... [illegible]

Pg-04

7th floor

14/02/23

25) Wb(Gb-Jb) - 22, 24, 26, 28. - 108, 108.6, 108.9, 109.6, 107.8. — (29-30)

6th floor

27) Wb(Gb-Jb) - 22, 24, 26, 28. — x — (15-30)

5th floor.

28) Gb(Wb-Tb) - 22, 26, 26, 24 — x — (12-32)

29) Tib(Gb-Jb) - 26, 24, 24, 22 — 108, 109, 110, 108.6, 105.8 — (18-72)

ground floor

The Measurements on this page were taken on 14/2

Pg-05

# Lift 4. (Tower B) NDT

Date :- 15/02/23

| Sl.no | Grid. | Rebound values | UPVT (All 300mm PL) | IDM's | Cover thickness |
|---|---|---|---|---|---|
| | | **Grand floor** | | | |
| 1) | Gb (7b-9b) | Half Col :- 22, 24, 24, 26. | 412, 427, 437, 462, 397, 419 | | 20-28 |
| | | **Basement floor** | | | |
| 2) | 7b (Gb-Jb) | 24, 20 (Debond plaster) | 156, 137, 147 Problem | | Debond |
| 3) | Jb (7b-9b) | 22, 24, 22, 24. | 112, 108, 106, 107. 106.7, 109, 108.6. | | 19-31 |
| | | **1st floor** | | | |
| 4) | 7b (Gb-Jb) | 34, 36, 32, 36 34. | 102, 103.6, 109.1, 103.1 102.2, 10.6.2 | | 21-33 |
| | | **2nd floor** | | | |
| 5) | Gb (7b-9b) | 24, 26, 24, 24 24, 26 | - | | 18-30 |
| | | **3rd floor** | | | |
| 6) | 7b (Gb-Jb) | 24, 22, 26, 24 24 | 106.9, 108.1, 102.3. 121, 117, 112. | | 23-32 36.2 cut |
| 7) | Gb (7b-9b) | 20, 22, 24, 20, 22 | - | | 26-34. |
| | | **4th floor** | | | |
| 8) | Gb (7b-9b) | 28, 26, 26, 26 28 | | | |
| 9) | 9b (7b-9b) | 28, 30, 32, 34. | 107, 121, 118, 116 122, 115 | | |

The Measurements on this page were taken on 15/2

Pg-07

| Slno | Gbid. | RHT value | UPVT value (300Pa) ID | Cover |
|---|---|---|---|---|
| | | 5th floor | | |
| 10) | 7b(Gb-3b) | 24, 24, 26, 26, 24. | 107, 113, 109, 117, 118, 119. | 24-34 |
| | | 6th floor | | |
| 11) | 7b (Gb-3b) | 24, 26, 24, 24, 26. | 96, 84.5, 114, 116, 115, 98, | 26-33 |
| | | 7th floor | | |
| 12) | Gb(7b-9b) | rebarded | rebarded full | x |
| 13) | 7b(Gb-3b) | 24, 26, 24, 26 24. | - | - |
| 14) | 3b(7b-9b) | 24, 22, 24, 26 24. | | |
| | | 8th floor | | |
| 15) | 7b(Gb-3b) | 24, 26, 24, 24 | 118, 118, 137, 126, 127, 117. | 23-36 |
| | | 9th floor | | |
| 16) | Gb(7b-9b) | 26, 24, 24, 24 24 | - | 22-34. |
| | | 10th floor / 11th floor | rebarded | |
| 17) | Gb(7b-9b) | debarded full | x | do floor |
| 18) | 7b(Gb-3b) not rebarded slow | 24, 24, 26, 24 24. | | |

The Measurements on this page were taken on .....

x

Pg-98

15/02/23

| Sl no. | Grid | RHT values | OPVT values (300PL) DD | Cover thick. |
|---|---|---|---|---|
| | | 12th floor | | |
| 19) | 7b(7b-8) | 24,24,26,24<br>26,28 | 106, 107, 107·6, 101, 117, 107, | — |
| | | 13th floor | | |
| 20) | 6b(6b-7) | debonded | — — | — |
| 21) | 7b(6b-7b) | " | — | — |
| | | 14th floor | | |
| 22) | 6b | 28,30,28,30<br>28,30 | | |
| 23) | 7b | 26,26,28,26 | | |
| | | 15th floor | | |
| 24) | 7b | 28,26,28<br>26.28 | no data | 26—36. |
| | | 16th floor | | |
| 25) | 7b | 28,28,30<br>28,26. | no data | — |
| | | 17th floor | | |
| 26) | 6b | 24,26,26,24 | | |
| 27) | 7b | 26,24,24,26 | 101, 107, 111, 103, 104·1, 106, | 22—34 |
| | | 18th floor | | |
| 28) | 6b | debonded | | |
| | 7b | 24,26,26<br>28,26 | | 22-32 |

The Measurements on this page were taken on ..... 15/2 .....

Pg-09

| Sl. no | Grid | RHT values | UPVT Reading (300Pt) BD | Cover |
|---|---|---|---|---|
| | | 19th | | |
| 29 | Gb | 26, 28, 26, 26, 28. | — | — |
| | | 20th flo | | |
| 30 | Gb | 26, 26, 24, 26, 28. | — | — |
| | | 21th flo | | |
| 31 | Gb | 24, 26, 26, 26, 28. | — | 21-36 |
| 32 | Jb | 26, 28, 28, 26, 28. | — | |
| | | 22nd floor | | |
| 33 | Jb | 24, 26, 28, 24, 24, 26 | — | 18-38. |
| | | 23rd flo | | |
| 34 | Jb | 24, 26, 24, 26, 26. | — | 18-36. |
| | | 24th floor | | |
| 35 | Jb | 24, 24, 26, 28, 24 | 102, 106, 108, 106, 108, 107-6 | 18-31 |
| | | 25th floor | | |
| 36 | Jb | 18, 20, 22, 18 | × | 18-26 |
| 37 | Gb | 18, 22, 20, 22 | | |
| | | 26th floor | | |
| 38 | Jb | 18, 18, 18, 18, 16, 16 | | |

The Measurements on this page were taken on 15/2

Pg - 10

| Sl no | Grid | RHT values | UPVT Reading (Joor) | Gwt fib |
|---|---|---|---|---|
| | Gb, Fb, Sb | **Lift 3** | | |
| | | **Basement** | | |
| 1) | Sb | 22, 24, 24, 24, 24, 22 | 87.6, 89.2, 91.6, 92.3, 89.7, 89.2. | 30-53.2 |
| 2) | Fb | 24, 26, 28, 26, 28. | - | - |
| | | **Ground floor** | | |
| 3) | Sb | debond | - | tooth |
| 4) | Fb | | | |
| 5) | Gb | 24, 26, 26, 27 | - | tactfinish |
| | | **1st floor** | | |
| 6) | Fb | 26, 24, 26, 26, 28. | - | (20-34) |
| | | **2nd floor** | | |
| 7) | Gb | 26, 28, 26, 26. | 90, 90.6, 103, 110, 102, 103.3. | ( |
| 8) | Sb | → | | (10-12 |
| | | **3rd floor** | | |
| 9) | Sb | → | | (8-10) |
| 10) | Fb | 24, 26, 28, 26. | - | - |
| | | **4th floor** | | |
| 11) | Sb | 24, 26, 24, 24, 24 | | |
| | | **5th floor** | | |
| 12) | Gb, Sb, Fb | debond fell. | | |

The Measurements on this page were taken on ..... 1/2

Pg - 11

Gb | Sb | Fb

| Sl. no | Grid | RMT Readily | UPVT (300PL) (ID) | Carbo |
|---|---|---|---|---|
| | | **16th floor** | | |
| 13) | Gb | 24, 26, 26, 24 | 113, 121, 106, 107, 108, 82-9, | (22-36 |
| 14) | Sb | 24, 26, 24, 24 | | |
| | | **7th floor** | | |
| 15) | Sb | 24, 26, 24, 26, 24. | - | (20-36 |
| 16) | Gb | 18, 20, 22, 22 24. | - | (30-32 |
| | | **8th flr** | | |
| 17) | Gb | 24, 22, 26, 24, | - | - |
| | | **9th floor** | | |
| 18) | Sb | debonded — Crack | | |
| 19) | Gb | debonded — Crack | | |
| | | **10th floor** | | |
| 20) | Sb | 22, 20, 22, 22 | - | - |
| 21) | Gb | 22, 18, 20, 18 22 | 106, 108, 112, 113, 108, 106. | (18-36 |
| | | **11th floor** | | |
| 22) | Gb | 22, 20, 22, 22 | - | - |
| 23) | Sb & Fb | Cracky | Cracky | |

The Measurements on this page were taken on ..... 15/2

Pg-12

Gb | 5b | Fb : 15/02/23

| Sl. No. | Grid | RHT values | UPVT (300Pi) (ID) | Quantity |
|---|---|---|---|---|
| | | 12th floor | | |
| 24) | 5b | 22, 24, 24, 26<br>26. | 102, 106, 108, 101<br>111, 107 | (22-33) |
| | | 13th floor | | |
| 25) | Gb | 22, 24, 26, 24<br>26 | — | — |
| | | 14th floor | | |
| 26) | Gb<br>OF 5b | debonded | — | — |
| 27) | 5b → | 24, 26, 26, 20 | — | — |
| | | 15th floor | | |
| 28) | Gb | 20, 24, 24, 20<br>20 | 98, 103, 109, 101, 103<br>101. | (21-36) |
| | | 16th floor | | |
| 29) | Gb | debonded Cracks | — | — |
| 30) | Fb | 20, 22, 22, 20<br>24. | | |
| 31) | 5b | 24, 22, 22, 24<br>20. | | (18-31) |
| | | 17th floor | | |
| 32) | Fb | 22, 22, 24, 26<br>22 | 99, 102, 103, 111,<br>99, 101. | (19-33) |
| | | 18th floor | | |
| 33) | Gb | 22, 24, 22, 24<br>26. | | |

The Measurements on this page were taken on .....

Pg-15

| Sl. no | Grid | RHT values | UPVT (300PL) ID | Conc. Tech |
|---|---|---|---|---|
| | | 19th floor | | (22-36) |
| 34) | Sb | 26, 26, 24, 26, 24 | 102, 104, 101, 99, 103, 101.6. | |
| 35) | Gb | 26, 24, 28, 22 22 | — | — |
| | | 20th floor | | |
| 36) | Gb | — Cracks — | | |
| 37) | Sb | — Zppee rebound. & bottom = 20, 18, 12, 16. | | |
| | | 21st floor | | |
| 38) | Gb | — 24, 22, 20, 22, 22. | 94.2, 102, 88.6, 95.8, 102.6, 95.3. | (18-33) |
| | | 22nd floor | | |
| 39) | Fb | — 24, 22, 26, 24, 22. | — | — |
| | | 23rd floor | | |
| 40) | Sb | — 20, 22, 22, 20 24 | 94.8, 98.6, 111, 103, 97.2, 97.9. | |
| | | 24th floors | | |
| 41) | Fb | — 20, 22, 20, 22 24, 26. | — | (22-81) |
| | | 25th floor | | |
| 42) | Gb | — 20, 22, 18, 20 20, 22 | — | — |
| | | 26th floor | | |
| 43) | Sb | — 20, 18, 20, 20, 18 | 94.6, 101-2, 108-1 102-1, 106.2, 106.1 | (19-36) |

The Measurements on this page were taken on ..... 6/24

Pg-14

15/04/23

| Sl no | Grid | RHT values | UPV (300 PD) 2D | Ginger team |
|---|---|---|---|---|
| | | 2nd Lift | Db [7b] Fb | |
| | | Basement floor | | |
| 1) | Grid. 7b | 22, 24, 22, 22 26. | Ground. | 20 to 32 |
| 2) | 7b | 28, 26, 24, 27, 24 | 102, 106, 99, 107, 103, 103 | 20-36 |
| | | First floor. | | |
| 3) | 7b & Db & Fb | — Cracks — | Debond. | — |
| | | 2nd floor | | |
| 4) | 7b | 22, 26, 24, 26, 26, 22. | | {23 to 36) |
| 5) | Fb | 24, 26, 24, 26, 24 | | |
| | | 3rd floor | | |
| 6) | 7b | 22, 22, 24, 22 24, 29. | 92, 81.3, 87.8, 101.6, 102.7. 101.2 | {24 to 33) |
| 7) | Db | 24, 26, 22, 24 26. | | |
| | | 4th floor. | | |
| 8) | 7b | 26, 24, 26, 24, 26. | | 24 to 37) |
| | | 5th floor | | |
| 9) | Fb | 24, 26, 24, 26 24, | 99.3, 94, 98, 102, 103.2 103.1 | (19 to 36) |
| 10) | 7b | 24, 26, 24, 26, 22, 24. | | |

The Measurements on this page were taken on ..... SK

Pg-15

15/02/23

| Sl no | Room | RHT values | UPVT (300PL) ID | Comments |
|---|---|---|---|---|
| | | 6th floor | Db 7b Fb | |
| 11 | 7b | 24, 26, 24, 22 24 | - | - |
| | | 7th floor | | |
| 12 | 7b | Cracks Debonding | | - |
| 13 | Fb | Scaling | | |
| | | 8th floor | | |
| 14 | Fb | 24, 26, 24, 26, 22. | 103, 107.6, 109.7, 104.2 106, 111.7. | |
| 15 | Db | 24, 24, 26, 24, 27 | | |
| | | 9th floor | | |
| 16 | 7b | 24, 26, 24, 26, 22 24, 24. | | 18-32 |
| 17 | Fb | 26, 24, 26, 24, 24 | | |
| | | 10th floor | | |
| 18 | Db | 26, 24, 24, 24, 24 | | 21-36 |
| 19 | Fb | 24, 22, 22, 24 | 103, 109.6, 107.2, 106.5, 108.2, 109.1 | |
| | | 11th floor | | |
| 20 | 7b | 22, 26, 24, 26 | | (18-36 |
| | | 12th floor | | |
| 21 | Fb | 26, 22, 26, 24 24 | 107, 101, 109, 111, 113, 115. | 20-36 |

The Measurements on this page were taken on 15/2

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| Sl. no | Grid | RHT value | UPVT (300 PI) 3D | Gap thickness |
|---|---|---|---|---|
| | | 13th floor | Db \|7b\| Fb | |
| 22 | Fb | debonded Crack | | |
| 23 | 7b | 22, 24, 26, 24, 26 | | (18-37) |
| | | 14th floor | | |
| 24 | 7b | 24, 24, 22, 26 24, 26. | 102, 106.7, 115.7, 102.6 117.7, 113.6, | (24-33) |
| 25 | 7b | 26, 24, 24, 26 | | |
| | | 15th floor | | |
| 26 | 7b | 24, 26, 28, 28 | — | (26-31) |
| | | 16th floor | | |
| 27 | Db | Cracks debonded | | |
| 28 | 7b | 24, 26, 24, 26 | | |
| | | 17th floor | | |
| 29 | 7b | 24, 26, 24, 26, 24 | 106.2, 115, 100.8, 115.9, 127.7, 116.8, | |
| 30 | Fb | 24, 26, 26, 24, 26 | | (24-33) |
| | | 18th floor | | |
| 31 | 7b | 24, 26, 22, 24 26 | — | — |
| | | 19th floor | | |
| 32 | Db | 24, 22, 24, 26 24, | — | (18-34) |

The Measurements on this page were taken on 15/2

Pg-19

| Sl. | Grid | RHT value | UPVT Reading (3 Readings for each) | Cover |
|---|---|---|---|---|
| | | | Db 7b Fb | |
| | | 20th Floor | | |
| 33 | Db | → Cracks Debonded ← | | |
| 34 | 7b | 24, 22, 24, 24, 26. | 102, 103, 121, 107, 106, 178. | 19 to 22 |
| | | 21st Floor | | |
| 35 | Fb | 26, 24, 24, 26 | — | — |
| | | 22nd Floor | | |
| 36 | 7b | 26, 22, 24, 22 | | (15 to 34) |
| 37 | Fb | 22, 24, 24, 24 | | |
| | | 23rd Floor | | |
| 38 | 7b | 22, 24, 26, 24, 26, 28, | 103, 104, 103.6, 106.1, 103, 102.1 | — |
| 39 | Db | 22, 24, 24, 24, | | |
| | | 24th Floor | | |
| 40 | Fb | 22, 24, 22, 22 | — | (18 to 3) |
| | | 25th Floor | | |
| 41 | 7b | 22, 24, 22, 24 | — | — |
| | | 26th Floor | | |
| 42 | 7b | 22, 24, 24, 22 | 107.9, 107.3, 106.3 | (19 to 36) |
| 43 | Fb | 20, 20, 24, 20 | 107.3, 106.3, 107.3 | |

The Measurements on this page were taken on .....

15/02/23

| S.No | Grid | RHT reading | UPVT (300PL) ID | Comments |
|---|---|---|---|---|
| | | Lift 1 | 4b Fb 4b | |
| | | Basement | | |
| 1) | 7b | Upper rebard bottom 26 24,24 26 | 101.3, 98.9, 107.9, 102.3 | (18-34) |
| 2) | Fb | 24 26, 26, 24 | | |
| 3) | 4b | rebarred cracks. | | |
| | | Ground floor. | | |
| 4) | Fb | 24, 26, 24, 26, 24. | 106.6, 88.9, 116.3, 101.3, 104.3, 106.7. | (19-36) |
| 5) | 4b | 26 24, 26, 24 24. | | |
| | | 1st floor | | |
| 6) | Fb & 7b | rebarded (bottom) | | |
| | | Carbonation 2nd half cell | :- turn to Pink Effect | |
| | Major spalling @ Fb | | - 476, 487, 491 473, 497, 491 | |
| | | 2nd floor | | |
| 7) | Fb | Crack Spalling | | |
| | bottom | Carbonation | :- Pink (Effect) | |
| | | half cell | :- 501, 497, 496 496, 498, 498. | |

The Measurements on this page were taken on .....

Pg-19

15/02/23

| Slno | Grid | RHT reading | UPVT (300Pi) ID | Comments |
|---|---|---|---|---|
| | | 3rd floor | 7b Fb 4b | |
| 9) | Fb | 24, 22, 24, 26, 24 | 102, 106·7, 108·6, 107, 105 | (8 -13) |
| 10) | 7b | — cracks | 102·6. — | — |
| | | 4th floor | | |
| 11) | Fb | — Cracks | — | — |
| 12) | 4b | debond top | — | — |
| | | 5th floor | | |
| 13) | 4b | — Full cracks | — | — |
| 14) | 7b | — debond | — — | — |
| | | 6th floor | | |
| 15) | Fb | — Cracks | — — | — |
| 16) | 4b | middle (20, 22 18, 20) | — — | — |
| 17) | 7b | 20, 22, 24, 22 | — — | |
| | | 7th flo | | |
| 18) | 7b | 22, 24, 24, 22 | 106·2, 107·6, 86·7, 89·7, 90·6, 99·7. | |
| | | 8th floor. | | |
| 19) | Fb | — Spalling | — | — |
| 20) | 4b | — 20, 22, 20, 20 | — | — |
| | | 9th floor | | |
| 21) | Fb | — Full Cracks | | |

The Measurements on this page were taken on ..... 15/2

Pg 2

| Sl. No. | Grid | RHT values | UPVT (300PL) | ID | Cover Thick |
|---|---|---|---|---|---|
| | | 10th floor | 75 \| Fb \| Lb | | |
| 22 | Lb | 22, 24, 20, 20, 24 | 103, 106·7, 103, 107 107 3, 106·7 | | |
| 23 | Fb | Cracks observed | | | |
| | | 11th floor | 96, 100, 103, 114 | 19-34 | |
| 24 | Fb | 24, 24, 24, 24, 26 | 91·4, 112 | | |
| 25 | LF | 24, 24, 22, 26 | | | |
| | | 12th floor | | | |
| 26 | Lb | 24, 26, 24, 24, 26 | | | |
| 27 | Fb | Cracks Spalli | | | |
| | | 13th floor | | | |
| 28 | Fb | 24, 24, 26, 24, 24, | 97, 103, 103, 104, 105, 106G, 107. | 22-36 | |
| 29 | Tb | 24, 26, 24, 28, 26, | | | |
| | | 14th floor | | | |
| 30 | Lb | 24, 22, 24, 26, 24 | — | | — |
| 31 | Tb | 22, 24, 26, 20, 24 | | | |
| | | 15th floor | | | |
| 32 | Lb | 20, 24, 24, 24, 24 | 106, 109·7, 109·7, 106·7, 111, 112, 115 | | — |

The Measurements on this page were taken on .....

| Sl. no | Grid | RHT value | UPVT (300PL) | SD | Comments |
|---|---|---|---|---|---|
| | | | | 15/07/23 | |
| | | | 7b(Fb)4b | | |
| | | (16th floor) | | | |
| 34) | Fb | 24,22,26,26,26 | 106.7, 117, 118, 101 | | (18-32) |
| | | | 107, 108. | | |
| 35) | 4b | 22,24,24,22 | | | |
| | | (17th floor) | | | |
| 36) | 7b | 22, 24, 26, 22 | — | | — |
| | | 24. | | | |
| | | (18th floor) | | | |
| 37) | 6b | 24, 22, 24, 22, 24 | | | |
| 38) | Fb | 22, 24, 24, 22 | | | |
| | | (19th floor) | | | |
| 39) | Fb | 24, 22, 22, 20 | 107.7, 118, 112, 116 | | |
| | | 22. | 117.6, 117.7 | | |
| | | (20th floor) | | | |
| 40) | 4b | 22, 20, 22, 24, 24 | — | | |
| 41) | Fb | 20, 22, 20, 24 | | | |
| | | (21st floor) | | | |
| 42) | 4b | (mixer Crack) | — | | — |
| 43) | Fb | 20, 22, 24, 22 | | | |
| | | 20. | | | |
| | | (22nd floor) | | | |
| 44) | Fb | 20, 24, 20, 22 | 106, 108, 118, 103, | | |
| | | | 102, 111. | | |

The Measurements on this page were taken on ..... 15/2

15/12/23

| Sl. No. | Grid | RHT values | UPVT (300PL) DD | Conc. strength |
|---|---|---|---|---|
| | | 23rd floor | Tb - Fb - Ub | |
| 45 | Fb | 22, 24, 22, 24, 26, 24. | 106, 109, 111, 108, 117, 113 | (19-27) |
| | | 24th floor | | |
| 46 | Ub | 26, 20, 20, 24 | - | — |
| 47 | Tb | 22, 20, 20, 18, 20 | | |
| | | 25th floor | | |
| 48 | Fb | 20, 22, 22, 20, 22, 20 | - | (22-36) |
| 49 | Ub | 20, 22, 22, 20, 20 | | |
| | | 26th floor | | |
| 50 | Fb | 20, 24, 20, 22, 22 | 117, 116, 111, 113, 118, 119 7. | (22-3 |
| 51 | Ub | 22, 24, 22, 24, 25 | - | — |

The Measurements on this page were taken on ..... 15/12

Pg-23

Tower C

Lift Shear Walls

NDT

16/02/2023

| Sl.no | Grid | RHT value | UPVT value (300mm)dia 4C \| GC \| 7C | Cover |
|---|---|---|---|---|
| | | | Date: 16/2/23 | |
| | | **Lift-5** | | |
| | | Basement | | |
| 1) | GC | 16, 18, 18, 20<br>18. | 117, 109, 111, 89.1, 108.1<br>105.<br>(Upper rebound | 196<br>33 |
| 2) | 7C | 16, 18, 16, 18<br>18 | | |
| 3) | 4C | Cracks | | |
| | | Ground floor | | |
| 4) | 7C<br>8GC | debond. Crack<br>GC | Carbonation (Pink) Effected | |
| 5) | 4C | Crack in Edge<br>20, 18, 20, 23<br>(middle) | Half Cell :- 476, 441, 429<br>481, 496, 486 | |
| | | First floor | | |
| 6) | 7C | 16, 20, 16, 18<br>16. | | 33 |
| 7) | GC | 20, 18, 18, 20<br>16. | | |
| | | Second floor | | |
| 8) | All Side | rebounded replaster | | |
| | | Third floor | | |
| 9) | 7C | debonded | | |
| 10) | GC | 22, 20, 20, 18. | | |

The Measurements taken on this page were taken with ...K12.....

| S.No | Grid | RHT values | UPVT values | Cover |
|---|---|---|---|---|
| | | | 4C \| GC \| 7C Date:- 16/2/23 | |
| | | 4th floor | | |
| 11) | GC | 20, 20, 18, 20, 18 | 106, 111, 118, 103, 96, 91 | 22-35 |
| 12) | 4C | 16, 22, 18, 22, 26 | | |
| | | 5th floor | | |
| 13) | 4C & GC | Cocks detached | — | — |
| 14) | 7C | 18, 20, 18, 18, 20. | | |
| | | 6th floor | | |
| 15) | GC | 20, 20, 20, 20, 18 | | 20 to 34 |
| 16) | 7C | rekeadad — | — | — |
| | | 7th floor | | |
| 17) | GC | detached — | — | — |
| 18) | 4C & 7C | " | " | ~ |
| | | 8th floor | | |
| 19) | 7C | 20, 20, 18, 20, 20 | 107, 107, 109.6, 110.6, 111, 112. | (21-33) |
| 20) | GC | 18, 18, 18, 20, 20. | | |
| | | 9th floor | | |
| 21) | GC | 24, 22, 22, 22, 24 | | (18-34) |
| 22) | 4C | 22, 24, 22, 24, 22. | | |

The Measurements on this page were taken on ....

| Sl. | Spoid | RHT | UPVT 16/02/23 | Cork |
|---|---|---|---|---|
| | | 10th floor | 4C(GC)7C | |
| 23) | GC | 22, 24, 22, 22<br>20. | | |
| | | 11th floor | | |
| 24) | 7C | 22, 20, 20, 22, 20 | 78·6, 83·6, 86·1,<br>76·8, 83·9, 67·7 | (18-36) |
| 25) | 4C | 20, 22, 22, 20<br>20. | | |
| | | 12th floor | | |
| 26) | 6C | Debard Creek | — | — |
| 27) | 7C | 22, 24, 20,<br>24, 22. | — | — |
| | | 13th floor | | |
| 28) | GC | 22, 22, 24, 22<br>24. | — | (19-36) |
| | | 14th floor | | |
| 29) | 4C | 82, 24, 20, 24<br>20. | 87, 85·6, 97·1, 96·1<br>86·9, 82·1 | (21 to 51) |
| 30) | GC | 22, 20, 24, 20<br>22 | | |
| | | 15th floor | | |
| 31) | 7C | 22, 24, 22, 24<br>22 | — | — |
| | | 16th floor | | |
| 32) | GC | 22, 20, 22, 24<br>24 | | |

The Mean ... on this page were tenchi...

15/2 (18-33)

| Sl. No. | Grid | RHT | UPVT | Cover |
|---|---|---|---|---|
| | | 17th floor | 16/02/23 4(GC) 7 | |
| 33 | 4C | 22, 20, 22, 20 | – | (18-31) |
| | | 18th floor | | |
| 34 | GC | 20, 22, 20, 22, 20 | 107, 106, 101, 103, 108, 109. | – |
| 35 | 7C | 20, 22, 20, 20, 22 | | |
| | | 19th floor | | |
| 36 | 7C | 20, 22, 20, 22, 20 | – | – |
| 37 | 4C | 20, 22, 22, 22, 20 | | |
| | | 20th floor | | |
| 38 | GC | 24, 20, 20, 22, 22. | – | (22-34) |
| 39 | 7C | 20, 22, 24, 20, 22 | | |
| | | 21st floor | | |
| 40 | GC | 22, 20, 22, 22, 23, | 87.9, 92.6, 92.6, 93.3, 89.1, 93.1 | (18-33) |
| | | 22nd floor | | |
| 41 | 7C | 22, 20, 22, 20, 22 | | – |
| | | 23rd floor | | |
| 42 | 4C | 20, 22, 22, 20, 20 | | |
| | | 24th floor | | |
| 43 | GC | 22, 18, 22, 20, 18 | – | (21-30) |

The Measurements on this page were taken on ....

Pg NO-27

| Sl. | Grid | RHT | OPT 16/02/23 | Cmt |
|---|---|---|---|---|
| | | | 4(Grid 7C | |
| | | 25th floor | | |
| 44) | 7C | 18, 20, 22, 18<br>22 | | (38-1<br>51 |
| 45) | 4C | 18, 20, 22, 22<br>20 | | |
| | | 26th floor | | |
| 46) | GC | 18, 20, 22, 20<br>22 | 87·6, 111, 987, 996<br>997, 887 | |
| 47) | 7C | 20, 18, 20, 20<br>20. | | |

The ' ... this
were taken on 16/2

Pg No-28

Grid

Lift 4

Date:- 16/02/22

GC 79 JC

Cover

Basement

1) JC 16, 18, 16, 16, 18, Reading Husband (Doubt)

2) JC 18, 18, 20, 18, 20.

Ground floor

3) JC 20, 18, 18, 18, 20 (18-33)

First floor

4) JC 20, 18, 20, 20, 18 126, 129, 113, 119, 126, 125 7. (22-34)

2nd floor

5) JC demand

GC "

JC 20, 22, 20, 20, 20

3rd floor

6) GC Crack

7) JC 18, 20, 22, 20 22.

4th floor

8) JC debarked

9) GC 20, 22, 22, 20 22.

5th floor

10) JC 22, 20, 22, 20

The measurements on this page were taken on 16/2

(18-34)

Page No -29

| Sl. No. | Grid | RHT | UPVT 16/02/23 | Comments |
|---|---|---|---|---|
| | | 6th floor | GC (7) JC | |
| 11) | GC RJC | full Crack | — | |
| 12) | 7C | 22,20,20,18 20 | — | — |
| | | 7th floor | | |
| 13) | JC | 20,22,20,22,20 | 118,117,108,109, | (22 - 31) |
| 14) | GC | 20,22,20,20 | | |
| | | 8th floor | | |
| 15) | 7C | 20,18,20,20,18 | 108,103.6,103.7 109.1,107.1,109.7 | — |
| 16) | JC | 20,18,20,18,20 | | |
| | | 9th floor | | |
| 17) | 7C (BG | rebounded | — — | — |
| 18) | JC | 20,22,20,22 | | |
| | | 10th floor | | |
| 19) | JC | 22,20,20,22,20 | — | — |
| 20) | GC | rebounded | | |
| | | 11th floor | | |
| 21) | JC | rebounded | — | |
| 22) | GC | rebounded | — — | |

The measurements on this page were taken on 16/2

Pg No - 30